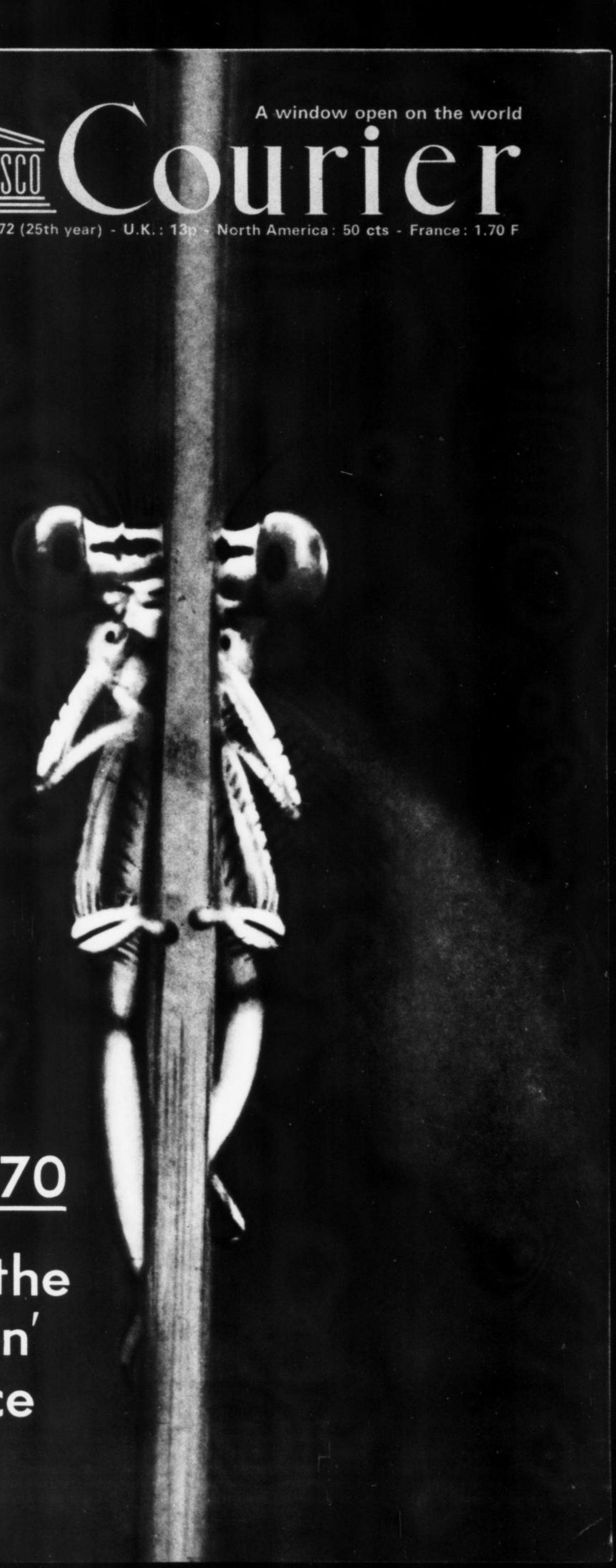
The UNESCO Courier

A window open on the world

February 1972 (25th year) - U.K.: 13p - North America: 50 cts - France: 1.70 F



Nobel Peace Prize Winner 1970

The 'Father of the Green Revolution' argues in defence of DDT

Photo © André Bilet, Paris

'Aloalos' twelve feet high

TREASURES OF WORLD ART

63 *Madagascar*

The people of Madagascar decorate their tombs with distinctive and often surprising effigies that differ from one part of the island to another. The Mahafali, who live in the arid south-west corner of Madagascar, raise totem-like carved wooden planks called "aloalos". Between six and twelve feet high, they are topped with wooden statuettes of people, animals, houses, bicycles, aeroplanes, motor-cars and many other figures that may recall the work or the interests of the dead person. A proud pair of ducks surmount the "aloalo" shown here and the carving of a zebu on another tomb is seen in the background. Figures of these long-horned cattle figure on many tombs since the zebu not only occupies an important place in daily life, but also has a religious significance. Funeral ceremonies are traditionally accompanied by the sacrifice of a zebu to venerate the dead.

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FEBRUARY 1972
25TH YEAR

PUBLISHED IN 12 LANGUAGES

English
French
Spanish
Russian
German
Arabic
Japanese
Italian
Hindi
Tamil
Hebrew
Persian

Published monthly by UNESCO

The United Nations
Educational, Scientific
and Cultural Organization

Sales and Distribution Offices
Unesco, Place de Fontenoy, Paris-7e.

Annual subscription rates: £1.30 stg.; $5.00 (North America); 17 French francs or equivalent; 2 years : £2.30 stg.; 30 F. Single copies : 13 p stg.; 50 cents : 1.70 F.

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The UNESCO COURIER is published monthly, except in August and September when it is bi-monthly (11 issues a year) in English, French, Spanish, Russian, German, Arabic, Japanese, Italian, Hindi, Tamil, Hebrew and Persian. For list of distributors see inside back cover.

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The Unesco Courier is indexed monthly in the Readers' Guide to Periodical Literature, published by H. W. Wilson Co., New York, and in Current Contents - Education, Philadelphia, U.S.A.

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N° 2 - 1972 MC 72-2-274 A

1972 International Book Year

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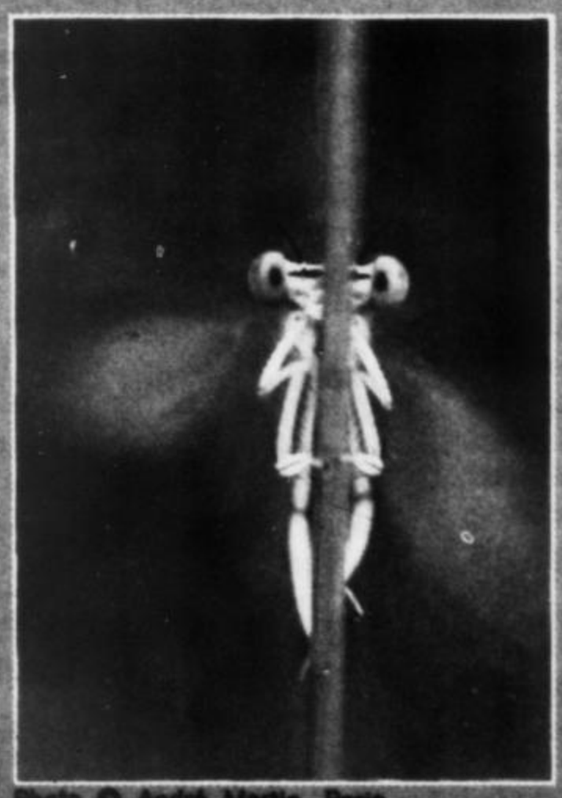


Photo © André Martin, Paris

Cover

Conventional insecticides are needed to control 80 to 90 per cent of the insect problems affecting agriculture and public health today, says American scientist Norman E. Borlaug in reply to those who urge the banning of DDT (see page 4). Research to find new techniques and methods must be strengthened, he says, but pesticides and chemical fertilizers remain indispensable if agricultural yields are to be raised without increasing the areas under cultivation; in this way they contribute indirectly to the preservation of animal and plant life by reducing the encroachment on forest, marshland, etc. Photo shows a dragonfly resting for a moment on a reed.

The 'Father of the Green Revolution' speaks out

IN DEFENCE OF DDT AND OTHER PESTICIDES

Photo Pechiney-Progil, Paris

Are pesticides and chemical fertilizers as harmful as some people claim? The "Unesco Courier" has devoted space in the past to opposing views on this controversial question, on the one hand favourable to DDT and pesticides (Gene Gregory in "The Magic of Modern Chemistry", June 1971) and a number of articles pointing to the danger of DDT and other pesticides ("Man the Killer of Nature", a U.N. report on problems of the environment, August-September 1970; "SOS Environment", a message from 2,200 scientists, July 1971). In addition, our Letters to the Editor column has contained many letters opposing the use of DDT etc.

In this issue we publish large extracts from the 1971 McDougall Memorial Lecture delivered on November 8, 1971, at the Food and Agriculture Organization in Rome by Nobel Peace Prize winner Norman E. Borlaug. Dr Borlaug was awarded the Nobel Prize for his contribution to the Green Revolution in agriculture (see page 6). His address was entitled "Mankind and Civilization at Another Crossroads". Here Dr. Borlaug makes a vigorous refutation of the campaigns being staged in the name of the protection of the environment against chemical products such as DDT and certain fertilizers. Dr. Borlaug considers that not only do these products do a great deal more good than harm, but that their use is essential to the survival of a large portion of mankind, particularly in the developing world.

by Norman E. Borlaug

Nobel Peace Prize 1970

ONCE again the "Naked Ape"—homo sapiens—stands at a crossroad. Before deciding along which road to proceed, he hesitates and glances behind at the long road he has trod.

He is both amazed and proud of the tremendous progress he has achieved as he manœuvred and advanced along the pitfall-laden trail of human survival during the brief period he has inhabited the planet Earth. Within the last second—representing a short 5 million years as measured on the geologic clock—he remembers emerging from the bush somewhere in south-east Africa, standing upright on his back legs and beginning to assume the role of Desmond Morris's so-called "Naked Ape".

With a club in one hand and a rock in the other, he stalked animals and became a carnivore. For a long time he struggled for survival as a hunter and food gatherer under the hostile environmental pressures dispensed by a fickle mother nature. More than once he barely averted extinction. He remembers having seen certain other species perish, because of their inability to adjust to the capriciousness of the environment. They have left for posterity only a fragmented history of their existence recorded in the book of fossil rocks.

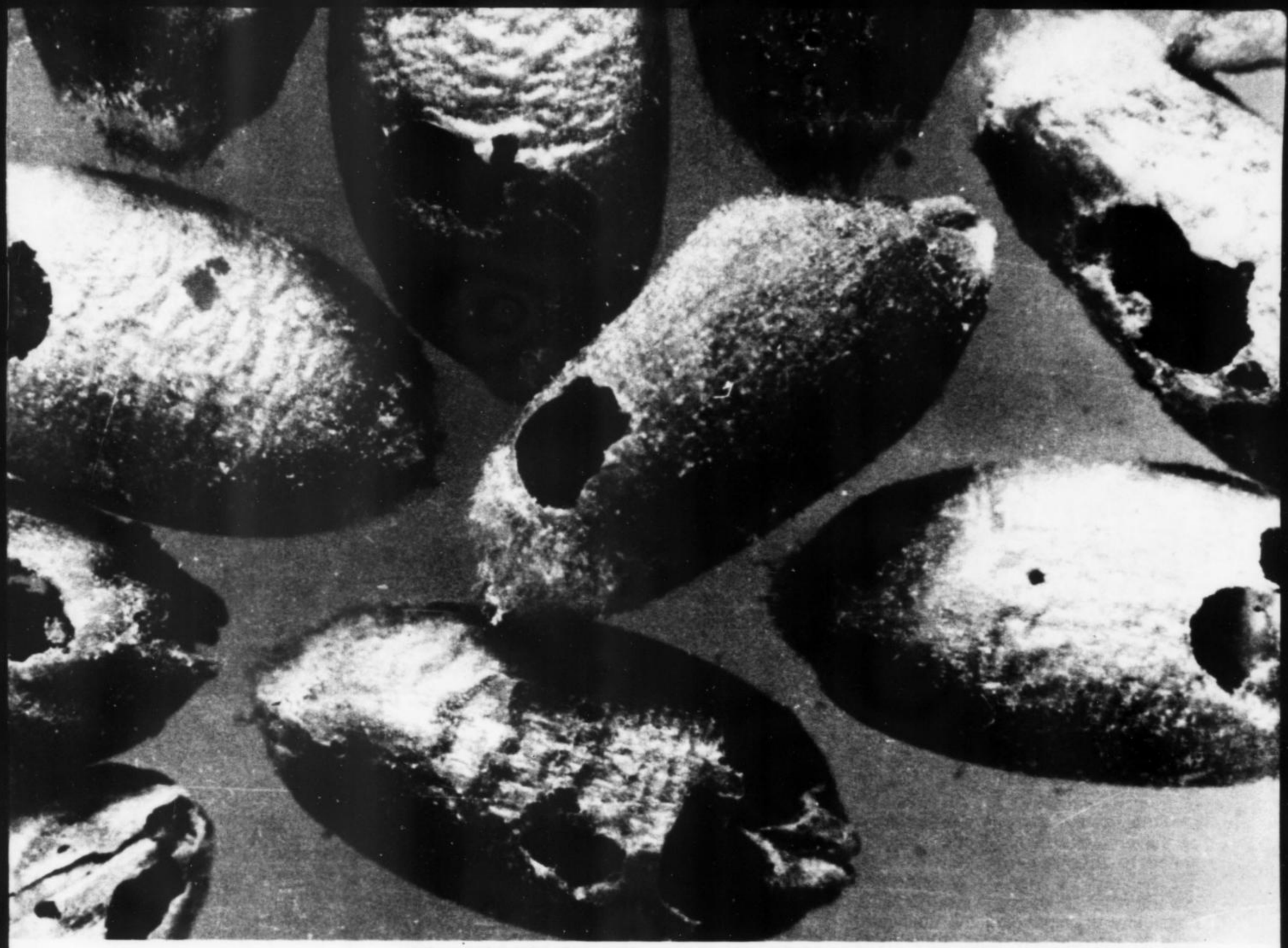
During his long early period as a hunter, social progress was negligible. Survival itself was man's only sense of achievement. Then his helpmate, neolithic woman, only about 9,000 years ago, invented agriculture and animal husbandry. This brought new hope. It ensured his food supply and lightened his load. Survival became less of a problem. The quality of human life improved. It gave him time for pleasure and time to think. There was time to develop his intellect, a society and, subsequently, a culture.

He made many worthwhile scientific discoveries that made life more comfortable, gratifying and enjoyable. Among these were the discoveries of control for many diseases that had plagued and scourged him from the beginning of time.

With the control of diseases and the resultant drop in death rates, combined with a reliable food supply, human population growth soared. The population monster looms ahead and now threatens to obstruct further progress, and even to erode progress already achieved, unless tamed.

All these events that have taken place along the tortuous road of human progress over which the Naked Ape has travelled, flash back to him now, as he hesitates and reflects before turning forward again to make the necessary decision as to which road to choose, at this, the most complex series of crossroads and intersections that he has ever encountered along the highway of social evolution.

He realizes, as he now meditates his decision, that the world civilization has split into two factions—the privileged world of the developed nations and the improverished world of the developing nations. One is living a life



Wheat ruined by the granary weevil. An estimated 20 per cent of the annual world food crop plantings is destroyed or damaged by diseases, insects and other pests.

of luxury never before experienced by man outside the proverbial Garden of Eden; the other still leads a life of misery built on poverty. Discordant voices cry out to counsel him now concerning his choice at the next crossroad.

One of the siren songs is that of the so-called establishment which counsels continuing on the road that has brought the high standard of living to the developed or privileged nations. This infers that these benefits can be extended to those in the underdeveloped world by following the same path.

A second tone cries out against the establishment and the materialistic world, even while they themselves are living as social drop-outs, social parasites in reality.

The third, and most seductive voice, is that of those extreme environmentalists who discredit science and advocate a back to nature movement. They demand the discontinuation of the use of chemical compounds—even though they are absolutely essential for protecting man against diseases, and for restoring fertility to the worn out soil so man can produce his food, and protect his crops against the ravages of weeds, diseases and insects.

Civilization as it is known today could not have evolved, nor can it survive, without an adequate food supply. Yet, food is something that is taken for granted by most world leaders, despite the fact that more than half of the population of the world is hungry and an even larger proportion malnourished.

With the help of our science we must not only increase our food supplies, but also ensure them against biological and physical catastrophes, through international efforts involving both developed and developing nations.

International granaries for food reserves financed by all nations should be established for use in case of need. These granaries should be strategically located in different geographical areas so as to simplify logistics in time of emergencies. And these food reserves must be made available to all who need them—and before famine strikes, not afterwards.

Man can and must prevent the tragedy of famine in the future instead of merely trying with pious regret to salvage the human wreckage of the famine, as he has so often done in the past. We will be guilty of criminal negligence, without extenuation, if we permit future famines. Humanity cannot any longer tolerate that guilt.

The destiny of world civilization depends upon providing a decent standard of living for all mankind. It has been said that "Universal and lasting peace can be established only if it is based upon social justice. If you desire peace, cultivate justice". Almost certainly, however, the first essential component of social justice is adequate food for all mankind.

I feel that the aforementioned guiding principle must be modified to read: "If you desire peace, cultivate justice, but at the same time cultivate the fields efficiently to produce more bread; otherwise there will be no peace."

During the past five years, spectacular progress has been made in increasing wheat, rice and maize production in several of the most populous developing countries of southern Asia, where widespread famine appeared

CONTINUED NEXT PAGE

NORMAN BORLAUG AND THE 'GREEN REVOLUTION'

The Nobel Peace Prize was given in 1970 to the "Father of the Green Revolution", Norman Borlaug, for his work in developing the high yield varieties of wheat that have dramatically expanded the food supply of the hungry countries in recent years. In the 1950s, Norman Borlaug, seen below checking an experimental wheat crop at the International Maize and Wheat Improvement Center, in Mexico, set out with a team to develop a disease-resistant, high-yielding dwarf wheat that would perform well under varied geographical conditions. The results were spectacular. In 20 years wheat production in Mexico increased six-fold and similar increases have been registered in India, Pakistan, Turkey and

Photo Marc and Evelyne Bernheim © Rapho, Paris

IN DEFENCE OF DDT *(Continued)*

inevitable only six years ago. Most of the increase in production has resulted from increased yields of grain per hectare, a particularly important development because there is little possibility of expanding the cultivated area in the densely populated areas of Asia.

The term "Green Revolution" has been used by the popular press to describe the spectacular increase in cereal grain production during the past five years. Perhaps the term Green Revolution, as commonly used, is premature, too optimistic, or too broad in scope. Too often it seems to convey the impression of a general revolution in yields per hectare and in total production of all crops throughout vast areas comprising many countries.

These implications both oversimplify and distort the facts. The only crops which have been appreciably affected up to the present time are wheat, rice and maize. Yields of other important cereals, such as sorghums, millets and barley, have been only slightly affected; nor has there been any appreciable increase in yield or production of the pulse or legume grain crops, which are essential in the diets of cereal consuming populations. Moreover, it must be emphasized that thus far the great increase in production has been in irrigated areas.

Nevertheless, the number of farmers, small as well as large, who are adopting the new seeds and new technology is increasing very rapidly, and the increase in numbers during the past four years has been phenomenal. Cereal production in the rainfed areas still remains relatively unaffected by the impact of the Green Revolution, but significant change has been made in several countries during the past three years.

Despite these qualifications, however, tremendous progress has been made in increasing cereal production in India, Pakistan and the Philippines during the past three years. Other countries that are beginning to show significant increases in production include Afghanistan, Algeria, Brazil, Ceylon, Indonesia, Israel, Iran, Kenya, Malaysia, Morocco, Thailand, Tunisia and Turkey.

Before attempting to evaluate the significance of the Green Revolution one must establish the point of view of the appraiser. The Green Revolution has entirely different meanings to most people in the affluent nations of the "privileged world" than to those in the developing nations of the "forgotten world".

Most people in industrialized societies have difficulty in comprehending and appreciating the vital significance of providing high-yielding strains of wheat, rice, maize, sorghum and millet for the people of the developing nations.

There are no miracles in agricultural production. Nor is there such a thing as a miracle variety of wheat, rice or maize which can serve as an elixir to cure all ills of a stagnant, traditional agriculture. Nevertheless, it is the Mexican dwarf wheat varieties and their newer derivatives that have been the principal catalyst which triggered off the Green Revolution.

If the high-yielding dwarf wheat and rice varieties were the catalysts that ignited the Green Revolution, then chemical fertilizer was the fuel that powered its forward thrust. The responsiveness of the high-yielding varieties has greatly increased fertilizer consumption. The new varieties not only respond to much heavier dosages of fertilizer than the old ones but are also much more efficient in its use.

The continued success of the Green Revolution will hinge, however, upon whether agriculture will be permitted to use the inputs—agricultural chemicals—including chemical fertilizers and pesticides, both absolutely necessary to cope with hunger. If agriculture is denied their use because of unwise legislation that is now being promoted by a powerful lobby group of hysterical environmentalists—who are provoking fear by predicting doom for the world through chemical poisoning—then the world will be doomed but not by chemical poisoning, but from starvation.

The current vicious, hysterical propaganda campaign against the use of agricultural chemicals, being promoted today by fear-provoking, irresponsible environmentalists, had its genesis in the best-selling "half-science, half-fiction novel" *Silent Spring*, published in 1962.

This poignant, powerful book—written by the talented scientist Rachel Carson—sowed the seeds for the propaganda whirlwind and the press, radio and television circuses that are being sponsored in the name of conservation today.

other countries. The Borlaug techniques have since been applied to rice, corn, potatoes, cotton, millet and other crops. The International Rice Research Institute, set up in the Philippines in 1962, assembled some 10,000 strains of rice from every corner of the world and began a patient process of crossbreeding to produce a dwarf rice strain comparable to the wheats. Combining a dwarf variety from Taiwan with a tall variety from Indonesia, the Centre produced "IR-8", a new strain that can easily double the yield of most local rices in Asia. This rice and other new varieties since developed have saved millions from starvation. Left, an agriculturalist at Hyderabad's Andrah Pradesh Agricultural University prepares a rice plant for cross-breeding with a different strain. Right, centuries of toil went into the construction of these terraced rice fields in the Philippines which, thanks to the new rice strains, has become a net exporter of rice.

Photo © Paul Almasy, Paris

Photo © United Press Photos, Paris

It is both sad and unfortunate that *Silent Spring* was the last book which was written by this gentle, great scientist and authoress. She had previously contributed so much to the understanding of the beauties of nature in the best-sellers *Under the Wind* and *The Sea Around Us*.

The gravest defect of *Silent Spring* was that it presented a very incomplete, inaccurate and oversimplified picture of the needs of the interrelated, worldwide, complex problems of health, food, fibre, wildlife, recreation and human population. It made no mention of the importance of chemicals such as fertilizers and pesticides for producing and protecting our food and fibre crops. Nor did it mention that by producing more food per unit of cultivated area more land would be available for other uses, including recreation and wildlife.

Certainly the greatest inexcusable error of omission was that of neglecting to mention the valuable role DDT has played in bringing malaria under control in many countries.

Silent Spring convinced the general public that the use of pesticides—and especially DDT—was upsetting the "balance of nature" and was doing great damage to wildlife, especially birds and fishes. It implied that a number of species were facing extinction because of its use.

Moreover, it left the impression that agriculture really did not need insecticides if it changed its methods. It indicated that farmers by adopting a system of extensive mono-culture, have made their crops more vulnerable to pests than necessary.

According to this expert, farmers have compounded their errors more by applying insecticides in attempting to kill insect pests and in the process have generally only killed off the predators, parasites and pathogens that normally kept the insect under control, and thereby only further upset the "balance of nature."

Moreover, according to the author, insects have invariably soon developed resistance to the insecticide. It implied that, by shifting to other suitable insect control measures already available, the losses from insects could be kept under control without chemicals.

I am in complete agreement that we should try to preserve all forms of wildlife as part of our heritage, as far as it is possible to do so. On the other hand, let us not become egotistical to the point of assuming supernatural powers. A glance at the book of rocks tells us of the impotency of many species, including man against the forces of nature. Yet it is incredible that only a few, if any, of the leaders of the current environmentalist movement have studied palaeontology and the "parade of the species," in the geologic past.

Spencer estimates that 99 per cent of all the species that have lived, since the candle of life was first lit on the planet earth about 3.2 billion years ago, have flunked the adaptation imperative: "evolve or perish," and consequently have now become extinct.

The implied command: "evolve or perish" has been an unwritten natural law from the beginning of time. It is equally evident in the physical and biological world.

CONTINUED NEXT PAGE

IN DEFENCE OF DDT *(Continued)*

The multitude of changes in the physical features of the earth, as well as in our solar system itself, have repeatedly greatly modified the environment of the earth. Climates have changed time and again in many parts of our world. Vast areas that once possessed tropical climates have subsequently been covered by continental ice sheets. Areas that once were blessed with heavy rainfall have become desert and vice versa. These changes in environments have, in turn, exerted strong selection pressure on the evolution of all forms of life.

There are undoubtedly many subtle changes being exerted on the environment of the planet today that are beyond the influence and control of man. Man too, however, is exerting strong influence on the environment. The composite effect of the present day selection pressure of the environment, affected both by natural and human influences, will undoubtedly continue to take its toll of some species that are poorly adapted to the current world environment.

Rhodes, Zim and Shaffer estimate that there are at present approximately 1,100,000 species of animals, many of them very simple forms, and 350,000 species of plants that currently inhabit the planet earth. Of these, the United States Fish and Wildlife Service in 1966 listed 33 species of mammals, 49 species of birds and 9 species of reptiles and amphibians, and 38 species of fish in the U.S.A., which were either rare or endangered.

In discussing the causes for reduction in numbers and possible disappearance of these 129 species, the destruction of the habitat and disturbances resulting from man's activities were paramount. Pesticides were mentioned as possible contributing factors in only two cases. In the past three or four years there has been much propaganda, but little convincing scientific evidence, put forward by environmentalists indicating that DDT has contributed to the decline of the Bald Eagle, Peregrine Falcon, American Osprey and Californian Condor.

One does not need a thin egg shell hypothesis due to DDT to explain the reduction in the population of these species. The truth of the matter is that many ornithologists had reported on the reduction in populations of these large birds of prey as far back as the 1880s and 1890s, long before the time of DDT. It is almost a foregone conclusion, for anyone who uses some common sense, that one or more of these species is about to flunk the imperative "evolve or perish." Their habitats are being destroyed by the encroachment of man.

Protective legislation alone will not, in most cases, be adequate to save them. Dynamic research, propagation and good sound game management might do so, providing human popula-

CONTINUED PAGE 10

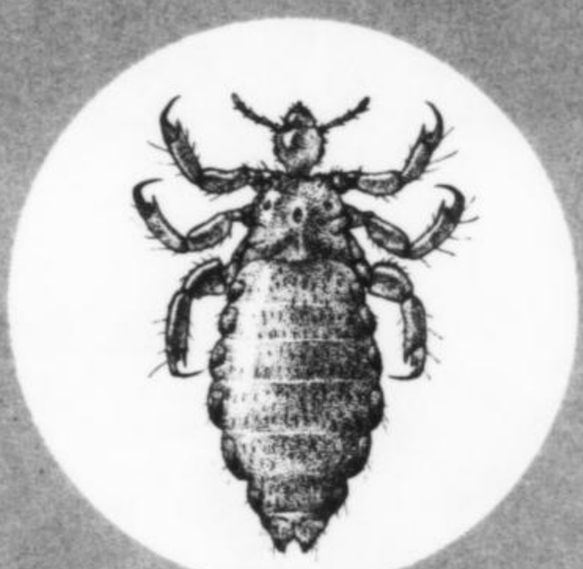
PARASITES...

MALARIA

Transmitted by the anopheles mosquito. DDT still protects several hundred million people exposed to this disease.

PLAGUE

Principal carrier: the rat flea. The sole means at present available for controlling this disease: pesticides.



TYPHUS

The human body louse transmits typhus and epidemic relapsing fever. Only current means of controlling serious epidemics: insecticides.

SLEEPING SICKNESS

Tsetse flies infect humans and cattle. Tsetse fly infestation of huge areas of Africa represents the loss of a potential cattle population of 125 million head. Only practical weapon now available: DDT or Dieldrin.

CHAGAS' DISEASE

Transmitted by reduviid bugs (sometimes called the kissing bug) which sucks human blood and causes cardiac disorders. One of the most serious and widespread maladies of Latin America. Only effective arm today: chemical insecticides.

KILLERS... PLUNDERERS

Since the appearance of DDT and other chemical pesticides 25 years ago, says the World Health Organization, it has been possible, for the first time, to combat the host of mosquitoes, fleas, lice, bugs, flies and other insects that are responsible for many of the diseases that plague the world. In the words of a 1971 WHO statement: "At one time, DDT was used against a host of insect-borne diseases: not only malaria, but plague, typhus, yellow fever, dengue, hemorrhagic fever, encephalitis, filariasis, sleeping sickness, onchocerciasis, leishmaniasis, etc. However, suitable alternatives have now become available for use against most of these diseases; but DDT must be retained for the control of malaria transmitted by mosquitoes and the sleeping sickness transmitted by tsetse flies".

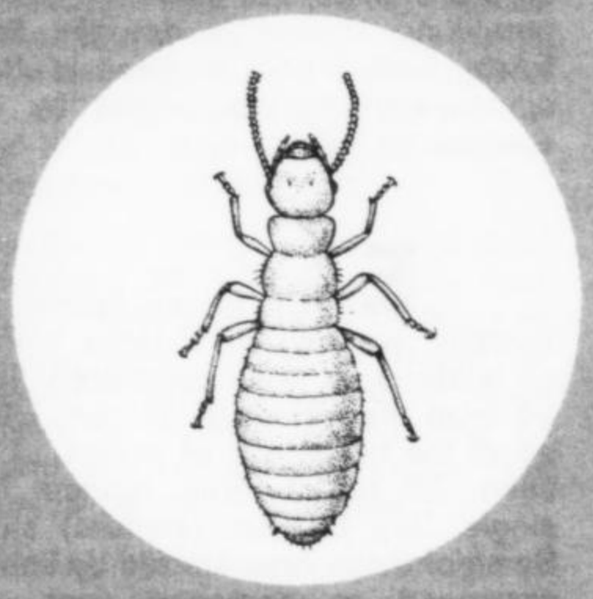
Left, some species of insects that constitute a threat to human health, and, right, some which plunder our food and crops and against which chemical pesticides remain, for the moment, our best defence. Below, an FAO aeroplane used in the battle against locusts in the Middle East. The world's desert locust zone extends to 65 countries on three continents. A single locust eats its own weight in food every day and a swarm of locusts will devour between 30,000 and 100,000 tons of vegetation in twenty-four hours. In the fight against this scourge, excellent results have been obtained, since 1945, by the spraying of chemical insecticides.

Drawings Thomas Prentiss © "Scientific American"

Photo FAO, Rome

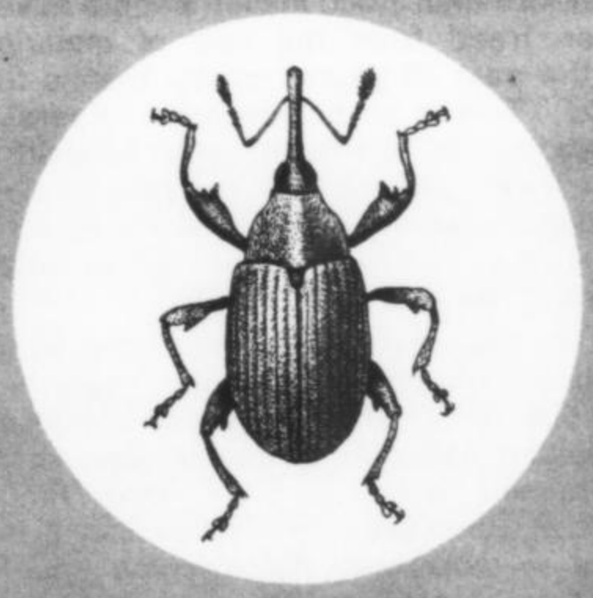
JAPANESE BEETLE

A fruit tree pest. The larva attacks the roots and the beetle the blossom of fruit trees. Scourge of Japanese orchards it has now invaded North America.



TERMITES

Sometimes known as the "white ant". Scourge of tropical countries. Destroys foodstuffs, clothing, wooden buildings and even boats.

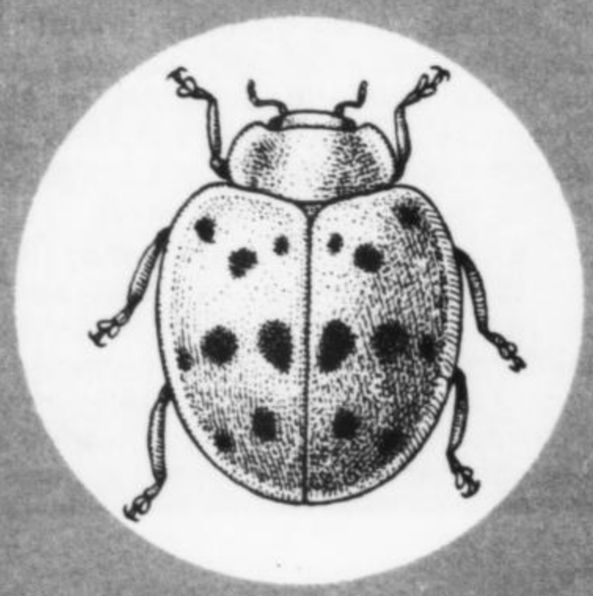


BOLL WEEVIL

Scourge of the cotton crops of North America. Can only be kept down by massive spraying programmes.

MEXICAN BEAN BEETLE

The beetle and its larvae eat the the leaves of several kinds of beans and related plants.



EARWORM

Larva of the owl moth. Devours the ear of the maize plant as it forms.

The banning of pesticides and chemical fertilizers would result in starvation and world chaos

tion pressures on their habitat are not too great.

Although it is generally the long-term continuing changes in the environment which exert their effects on the evolution and survival or the extinction of a species, there are many other changes in the environment that effect the more short-term "balance of nature," among the many species in a given habitat or ecosystem. These are the seasonal shifts we are concerned with in producing and protecting our crops or animals.

The cliché "in balance with nature," which is in common usage today by modern environmentalists is very misleading. It implies we would have a favourable "in balance with nature" to assure the protection of our crop species if the "balance of nature" were not upset by man. This, of course, is not true. Nor is there in existence a single "in balance with nature" ecosystem. Rather there is, within a given area, an infinite number of local and many more extensive merging ecosystems.

None of them are in static equilibrium. They are in a constant state of dynamic change, responding to the changes in the environment. At different times, the selection pressure provoking change is drought, floods, frosts, heat, insect or disease attacks, or invasion of the habitat by other species.

EARLY in my career as a forester working in a large primitive or wilderness area completely isolated from the influence of man, I learned of the fickleness of nature. I have seen 20 forest fires ignited by a single "dry thunder (electric) storm". Some of these fires started by lightning destroyed or damaged vast areas of several forest types (ecosystems).

In the same area I have seen tens of thousands of acres of lodgepole pine killed by Dendroctonus spp., infestation. The havoc done by the Dendroctonus beetle should not have happened according to some pseudo-ecologists, for it was, after all, a native insect pest with its entire army of natural predators, parasites and pathogens, and consequently should have been "in balance with nature."

Many times I have seen attempts made to grow cotton without the use of insecticides in the native home of the boll weevil in Mexico where all of the native predators of this insect were present. The results were disastrous.

In fact, it was difficult to tell from casual observation whether the cotton was being grown for the production of fibre to clothe man or for the production of feed for a native insect. Nevertheless, there should have been, according to our environmentalist jargon, an "in balance with nature" equilibrium.

I must also point out that modern agriculture—with 3,700 million people demanding food and fibre—has no choice but to grow extensive areas to a single crop in areas ecologically best suited to the culture of that crop. This was not true 5,000 years ago, when there was less population pressure, so that crops could be grown in small isolated fields.

It therefore becomes abundantly clear that we cannot rely on biological control alone to protect our food and fibre crops from the fickleness of nature. If we leave things to mother nature's whims, we will harvest only one third or one half of the yield per unit of cultivated area that can be harvested using a modern balanced technological package of practices.

Dr. Knipling has clearly indicated that we must, for the forseeable future, continue to use an integrated approach to control the insect pests of man, of the crops and of the animals on which he depends. Insect control is a complex problem for there are more than 200 insects that are or have been important on our main crops, animals and forests. We will need to use an integrated approach to hold them in abeyance.

It is true that in the past few decades spectacular control of a few insect species have been obtained with biological, bio-environmental or other non-chemical methods i.e. cottony-cushion scale of citrus, the spotted alfalfa aphid and the screw-worm of livestock in Florida.

Some day it may be possible to use alternate non-chemical methods to control many of the insects responsible for the most severe crop and animal losses, but that day, if ever attainable, lies far in the future.

Today, however, conventional insecticides are needed to control 80 to 90 per cent of the insect problems affecting agriculture and public health. Meanwhile, research to find new techniques and methods, must be strengthened. Present control programmes must be designed to take advantage of the best materials and techniques available so as to reduce losses to an acceptable level.

The environmentalists would now like to have a legislative ban placed on DDT so as to prohibit it for any use in the U.S.A. Almost certainly as soon as this is achieved, these organizations will begin a worldwide propaganda barrage to have it banned everywhere. This must not be permitted to happen, until an even more effective and safer insecticide is available, for no chemical has ever done as much as DDT to improve the health, economic and social benefits of the people of the developing nations.

The World Health Organization (WHO), with the assistance of the Pan American Health Organization and the United Nations Children's Fund (UNICEF), in 1955 launched a worldwide campaign against malaria, based on spraying the interior of all houses with DDT, so as to kill the Anopheline vector and break the cycle.

Of the 124 countries and territories in the tropics where malaria has existed, the disease has been eradicated from 19. There are 48 other countries in which eradication programmes are in progress and an additional 37 where extensive control programmes are under way. There remain only 20 nations in malarial areas where no programmes have yet been initiated.

THERE is also dramatic evidence from Ceylon of what can happen if a programme is stopped before eradication is accomplished. When the campaign was initiated in the mid 1950s there were more than two million cases of malaria in Ceylon. By 1962 it had dropped to 31 cases and by 1963 to 17, at which point the spray programme was discontinued for budgetary reasons. By 1967 the number of cases had jumped to 3,000 and by 1968 to more than 16,000. Before the programme could be re-established, in late 1969, two million cases had reappeared.

In summarizing the progress in this world wide malaria campaign on February 2, 1971, officials of WHO made the following statement:

"More than 1,000 million people have been freed from the risk of malaria in the past 25 years, mostly thanks to DDT. This is an achievement unparalleled in the annals of public health. But even today 329 million people are being protected from malaria through DDT spraying operations for malaria control or total eradication.

"The improvement in health resulting from malaria campaigns has broken the vicious circle of poverty and disease resulting in ample economic benefits: increased production of rice (and wheat), because the labour force is able to work, and the opening up of vast areas for agricultural production.

"The safety record of DDT to man is truly remarkable. At the height of its production 400,000 tons a year were used for agriculture, forestry, public

health, etc. Yet in spite of prolonged exposure by hundreds of millions of people, and the heavy occupational exposure of considerable numbers, the only confirmed cases of injury have been the result of massive accidental or suicidal swallowing of DDT. There is no evidence in man that DDT is causing cancer or genetic change."

Although more than 1,400 chemicals have been tested by WHO for use in malarial campaigns, only two have shown promise and both of these are far inferior to DDT.

As more and more scientific evidence accumulates, the charges against DDT become less and less convincing. There is evidence, of course, that man and most species of birds, fish and animals that have been examined have small quantities of DDT and/or other related componds such as polychlorinated bi-phenyls in their fat. But there is very little convincing evidence available to date which indicates that it is threatening the existence of any species, nor is it causing any discernible injury to man.

Part of the past confusion concerning pesticides in the environment derives from the tremendous improvements that have been made in recent years in chemical analysis. With gas chromotography it became possible to detect 1 or 2 parts per billion, or even a few parts per trillion, both of which, of course, would have gone unnoticed 20 years ago. But such sensitive methods can also detect contaminants and in the hands of inexpert operators may lead to wrong conclusions.

A recent article by Dr. Thomas H. Jukes, a reputable biochemist, emphasizes this dilemma: "How reliable is the test? There has been a great hue and cry over alleged traces of DDT in the Antarctic penguins, amounts of the order of 1 or 2 parts per billion. I have not yet been convinced of the validity of these results."

A few months ago at the University of Wisconsin, some soil samples that had been sealed since 1910 were tested for synthetic organochlorine pesticides by the latest, most delicate gas chromotographic procedure. Several pesticides were detected in 32 of the 34 samples. The only flaw was that these pesticides not only were not used in 1910, they did not even exist until 1940.

Another complication is that the residues of a class of modern compound called polychlorinated bi-phenyls (P.C.B.'s) interfere with the DDT test. The P.C.B.'s are used in water-proofing compounds, asphalt, waxes, synthetic adhesives, hydraulic fluids, electrical apparatus and general plastics. They are widely distributed in the fat of wildlife species, in which they have originated as industrial wastes taken up by aquatic species. To sum up, P.C.B.'s are not used as pesticides, but they interfere with pesticides residue analysis and they are toxic.

Another complicating factor in identifying the origin of chlorinated hydrocarbons in human, animal, bird or fish tissue is that many thousands of tons of chemical wastes of all kinds have been and are still being dumped into the oceans. Do not some of these also get into the food chain, even if they still have not got into the "hysterical word chain"?

IT is now obvious that the current aim is to ban DDT, first in the USA, and then in the world if possible. But DDT is only the first of the dominoes. But it is the toughest of all to knock out because of its excellent known contributions and safety record.

As soon as DDT is successfully banned, there will be a push for the banning of all chlorinated hydrocarbons, then in order, the organic phosphates and carbamate insecticides. Once the task is finished on insecticides, they will attack the weed-killers, and eventually the fungicides. As a matter of fact, by default, they have already been successful in having organic mercury seed disinfectants and slimeicides for papermills banned.

This ban was achieved during all of the confusion resulting from finding mercury in fish, first in fresh water species, in the Great Lakes, and rivers of the USA, and subsequently in both tuna and swordfish. The ridiculousness of some of this rhetoric came to light recently when someone analysed tuna caught 90 years ago and found it contained about the same level of mercury as those caught today.

Moreover, it has been shown that swordfish recently caught in ocean waters hundreds of miles from possible industrial contamination contained 1 to 2 p.p.m. of mercury. This indicates clearly that both tuna and swordfish are picking up the low levels of mercury from the ocean food chains, of which this metal has always been a part.

If the use of pesticides in the USA were to be completely banned, crop losses would probably soar to 50 per cent, and food prices would increase 4 to 5 fold. Who then would provide for the food needs of the low income groups? Certainly not the privileged environmentalists.

Within the past decade, because of the improved technology and higher yields, it has been possible to remove 50 million acres from cultivation and still meet both the domestic and export needs for agricultural products. Were the USA still relying on the 1940 technology, however, not only would the 50 million acres now held in reserve be back under the plough, but an additional area of 241.9 million acres by necessity would have been opened to cultivation. In reality it would require considerably more than 241.9 million acres of additional land since the quality of the land would be poorer than that now in cultivation.

In order to bring under cultivation an additional 241.9 million acres (and perhaps considerably more because of the poorer land quality) it would be necessary to open to cultivation lands that were in a large part rolling or semi-arid, and consequently vulnerable to erosion by water and wind.

It would also require clearing the forests from large areas so as to meet the food, feed, oil and fibre needs of the nation. Now reflect on the additional havoc that this expansion of cultivated area would do to wildlife habitat, and especially on rare and endangered species of animals and birds that are already on the brink of extinction.

Looking at it from another angle 291,9 million acres of land, an area roughly equivalent to the total land area of the USA east of the Mississippi river and south of the Ohio river, is today available for other uses, because of the improvements in crop production technology that have taken place in the past 30 years. These uses include recreation, wildlife and forestry.

It behoves all mankind to increase

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'The withdrawal of DDT would be a major tragedy in the chapter of human health and is unjustifiable in the light of present knowledge. Vast populations in malarious areas of the world would be condemned to the frightening ravages of endemic and epidemic malaria.'

— World Health Organization
February 12. 1971

the efficiency of agriculture throughout the world if we wish to alleviate human suffering, conserve wildlife and improve recreational opportunities. Unless the food production of East Africa is expanded to meet the growing food needs, the large animals in the Game Reserves of East Africa will be poached out of existence within the next three decades. Similarly, the elephant, tiger, and peacock will perish from India because of population pressure.

It is hard to understand why the conservation organizations and environmentalists have taken a negative rather than positive view in trying to protect wildlife. Why have they not promoted research and fought for more funds for game management in general? Why have they not fought for more funds for research so that qualified scientists can be assigned to study the reasons why certain threatened species are on the verge of extinction, and whether it is feasible to try to save them?

Why do they not spend more of their energies and funds on educating the public on the adverse effects of population pressure and rampant population growth on wildlife and the environment? How many of the US public, for example, know that more than 100,000 deer are killed each year by automobiles, whereas everyone is informed in the press or television whenever a few birds or fish are found dead, presumably—but this is not necessarily proven—from a pesticide?

Imagine the rhetoric that would be produced if 100,000 deer were killed by a pesticide.

I have been a great admirer of the spendid work that has been done by game management experts in the USA in re-establishing species, such as the wild turkey, that were nearly extinct. Under wise management and protection many other species of wildlife have made spectacular comebacks. The tremendous success of the introduction of the Chinese ring-neck pheasant, the Hungarian and Chukkar partridge, are other tremendous accomplishments. The research that has brought under control the lamprey, that threatened the survival of the lake trout is another tremendous achievement; so is the introduction of Coho salmon into Lake Michigan and Lake Superior. The breeding of faster growing and more sturdy salmon is another tremendous step forward.

I repeat what I have said many times before: without thinking, conservationists and environmentalists and only partially-informed people in the communications media have embarked on a crusade designed to end the use of agricultural chemicals, such as pesticides and fertilizers. They give no thought to the end result of such action: the eventual starvation and political chaos that will plague the world. ■

Photo © Jacques, Six, Paris

SIX INTERNATIONAL CENTRES FOR TESTING NEW INSECTICIDES

The World Health Organization has set up six international centres for the evaluation and testing of new insecticides and six stations for village-scale trials. WHO research helps to develop new weapons against harmful insects—replacements for the classic insecticides, which would be effective yet safe for large scale use, and biodegradable, and to which insects would be unlikely to become resistant. It also seeks for alternative methods of biological or genetic control of insects. To destroy mosquito larvae in areas where resistance to DDT has developed, fish-breeding centres are being developed in a number of countries (U.S., Iran, Greece, Italy, etc.) in which larvae-eating fish called "Gambusia" (right) are raised for release in ponds and lakes in infested areas. One Gambusia eats about 100 larvae per hour. Ladybirds, which have an insatiable appetite for aphids (photo above), are being raised by the million to reduce the damage caused by these insects to fruit trees. The Food and Agriculture Organization and the International Atomic Energy Agency are experimenting with new means of fighting certain insects, such as the Mediterranean fly which attacks fruit, by the sterilization of male insects by irradiation.

Photo © Paul Almasy, Paris

ANCIENT IRRIGATION AND MODERN SCIENCE

by Boris V. Andrianov

ACROSS the deserts of Asia from Arabia to Mongolia, outlines of fields and canals, traces of bygone farming and remnants of former settlements still mark the sites of ancient irrigation systems.

Those who have travelled to these places long remember the majestic ruins of cities with their formidable walls and towers, the dried-up canal beds and the vestiges of skilfully laid out but long-unploughed fields. Here, long ago, the farmer reaped bounteous harvests of wheat and cultivated grapes and melons.

In our day, every new achievement in science and engineering, every new improvement in technology, working tools and production as a whole removes us further and further from the long-forgotten and imperfect farming methods and techniques of Antiquity.

But these ancient skills and techniques should interest not only a small circle of scholars. Historians and archaeologists say that a knowledge of the concrete experience of long-vanished civilizations is of great economic value. Information about the distribution and nature of the now dry canals, for instance, can be used in evaluating water resources and in designing the basic course of major canals, and particularly in laying out networks of small irrigation ditches.

The lands that were irrigated in Antiquity make up one of the most potentially productive zones in the world: each irrigated hectare of land in the desert zone is four to five times more productive than a hectare of non-irrigated land.

In the last 20 years, the area under irrigation throughout the world has increased nearly threefold—from 80 million to 220 million hectares (200 million to 560 million acres). Today, scientists are preparing an even more decisive attack on the desert, and our knowledge of its past can make a valuable contribution to this campaign.

One Soviet scientist, V. V. Dokuchayev, has defined the soil as, "a natural-historical body" which reflects every change in natural conditions—climate, water conditions, vegetation and so on. During many centuries man's economic activity too has left its indelible traces in the soil.

Through a process lasting centuries, thousands of tons of salts were carried by water supply systems to every hectare of irrigated land, and these salts remained even after the cultivated lands turned into desert.

In ancient times, the struggle against salinity required the efforts of a whole army of workers to remove the surface layers of salts and carry them beyond the irrigated plots. In the state lands around Basra (Iraq), according to al-Tabari, a celebrated Arab historian of the Middle Ages, this work was done by thousands of black Zinji slaves. After the Zinji revolted in the year 869,

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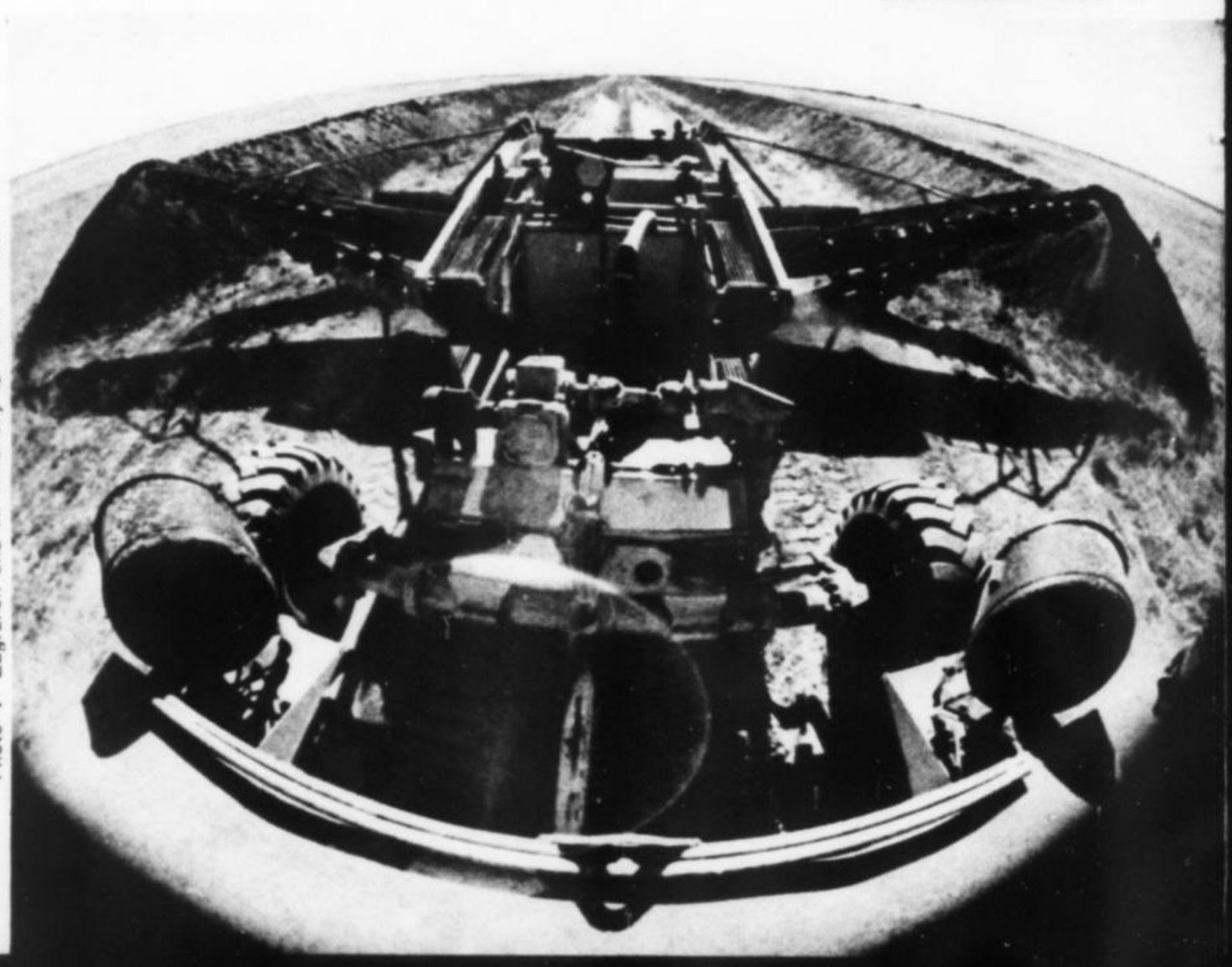

Photo V Zagranich and A. Miransky © APN, Moscow

BORIS V. ANDRIANOV *is a leading Soviet specialist on the history of ancient irrigation systems. He has written over 100 scientific studies, including an extensive monograph on the ancient irrigation systems of the Aral Sea region, and several books on the peoples of Africa. He is senior scientific worker at the Institute of Ethnography of the U.S.S.R. Academy of Sciences and scientific secretary of the Academy's Committee on the Practical Uses of Historical Data in the National Economy.*

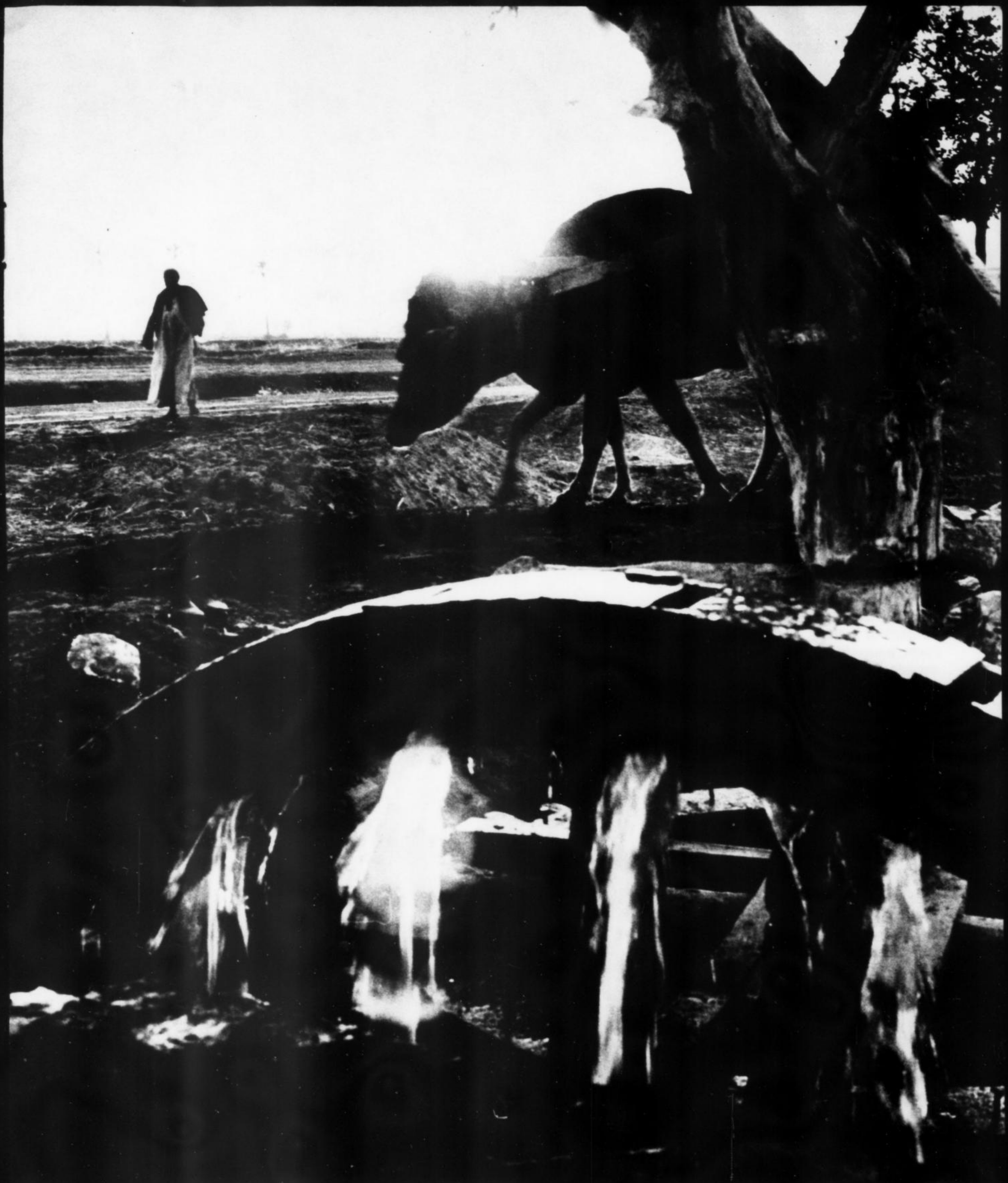

Photo © Paul Almasy, Paris

LESSONS FROM ANTIQUITY

Complex irrigation systems using a wide variety of storage tanks and canals existed on the Indus 5,000 years ago, and an elaborate code of water laws was applied on the Euphrates in 2050 B.C. Today's irrigation engineers have much to learn from their ancient counterparts in the matter of siting water supply systems to reclaim now arid but once fertile lands. Left, among other machines that help modern man to tame the deserts is this Soviet channel digger which cuts a trench three metres deep by 14 metres wide at the rate of about 100 metres a day. Ancient methods of lifting water are still used by farmers in many lands. Above, this "sakiya", a revolving wheel turned by bullock power, supplies water for crop irrigation in the Sudan.

ANCIENT IRRIGATION *(Continued)*

50,000 hectares of irrigated land were abandoned and ultimately turned into salt marshes.

Large areas of land in present-day Iraq are saltridden, and it is no accident that this problem has become the central theme of historical and archaeological research with long-term economic aims conducted in the Diala River basin by Iraqi experts and specialists from Chicago University's Oriental Institute.

The study of thousands of large and small ancient settlements has made it possible to reconstruct a broad historical picture of life in the oasis, to determine the size of the population during various epochs, and to answer many questions of practical significance for agriculture in the Republic of Iraq today.

In 1954-1955, specialists working on an assignment for Syria's Ministry of Agriculture used aerial photo mosaics of the Upper Gezir to draw up a map of the ancient irrigation systems on the river Habur. Many of these systems have been reconstructed, and crops now grow on what was only recently desert land. It would be expedient to include in current development plans for arid zone countries a broader utilization of formerly irrigated lands.

Large-scale historical and archaeological research projects with these aims have been under way for several decades now in the Soviet Union, where the remains of ancient irrigation systems have been located over an area of eight to ten million hectares—an area equal to all the land presently under irrigation in the U.S.S.R.

Half of the once-irrigated land lies at the lower reaches of the large Central Asian rivers, the Amu Darya and Syr Darya, along the shores of the Aral Sea. The region has a warm climate and a long, frost-free season, but rainfall is low and farming is possible only with artificial irrigation. All life here depends on the river waters and irrigation systems.

Armed with modern technology, the farmer has begun to develop the once-irrigated but now desert land surrounding the oasis. All in all, the area covers five million hectares.

The Khorezm archaeological and ethnographical expedition of the U.S.S.R. Academy of Sciences, headed by Corresponding Member of the Academy, S.P. Tolstov, has been working in this vast region for the past three decades. Experts in various fields—archaeologists, ethnographers, geographers, soil scientists, irrigators, geologists and aerophotographers—have joined in the

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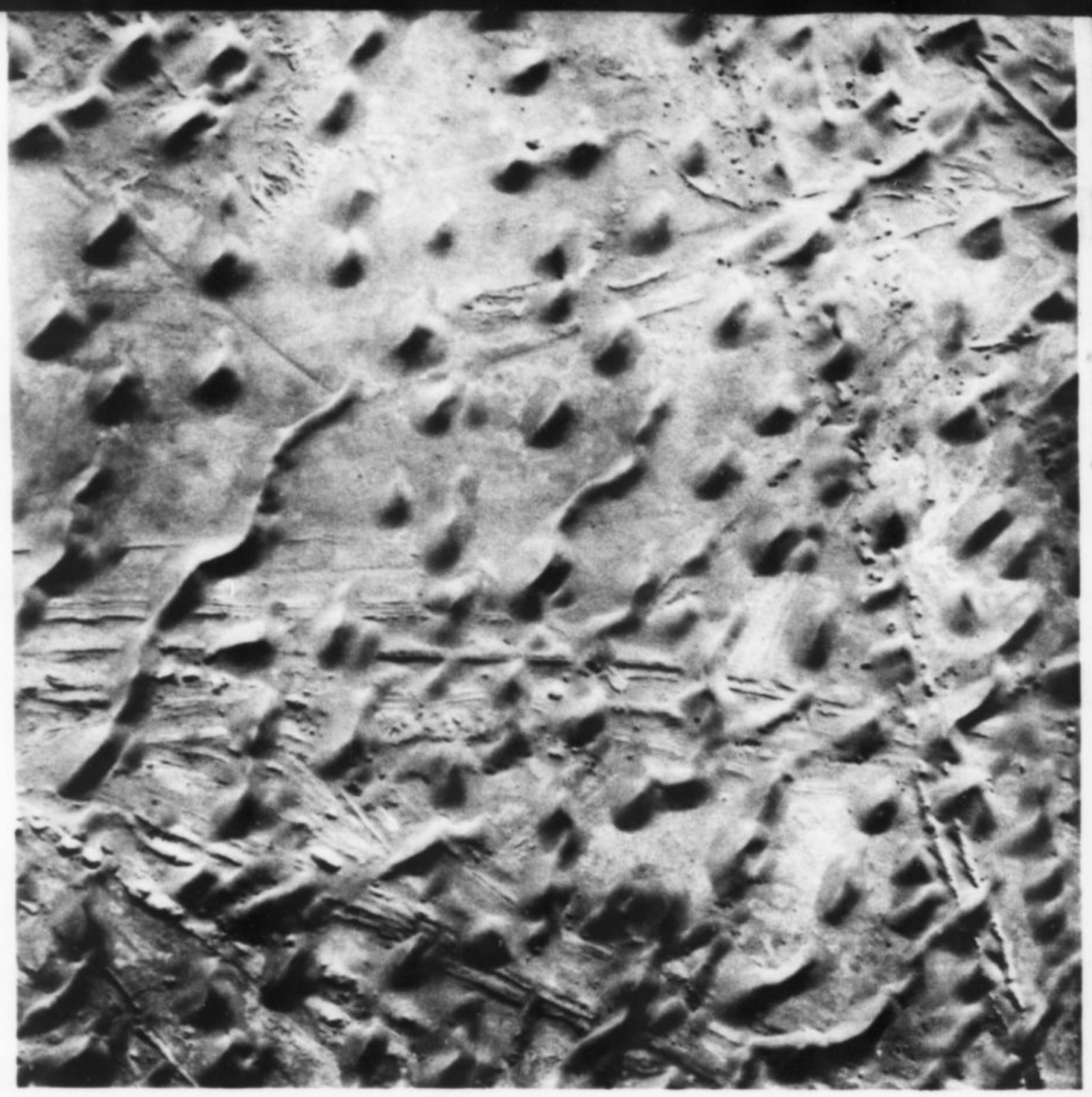
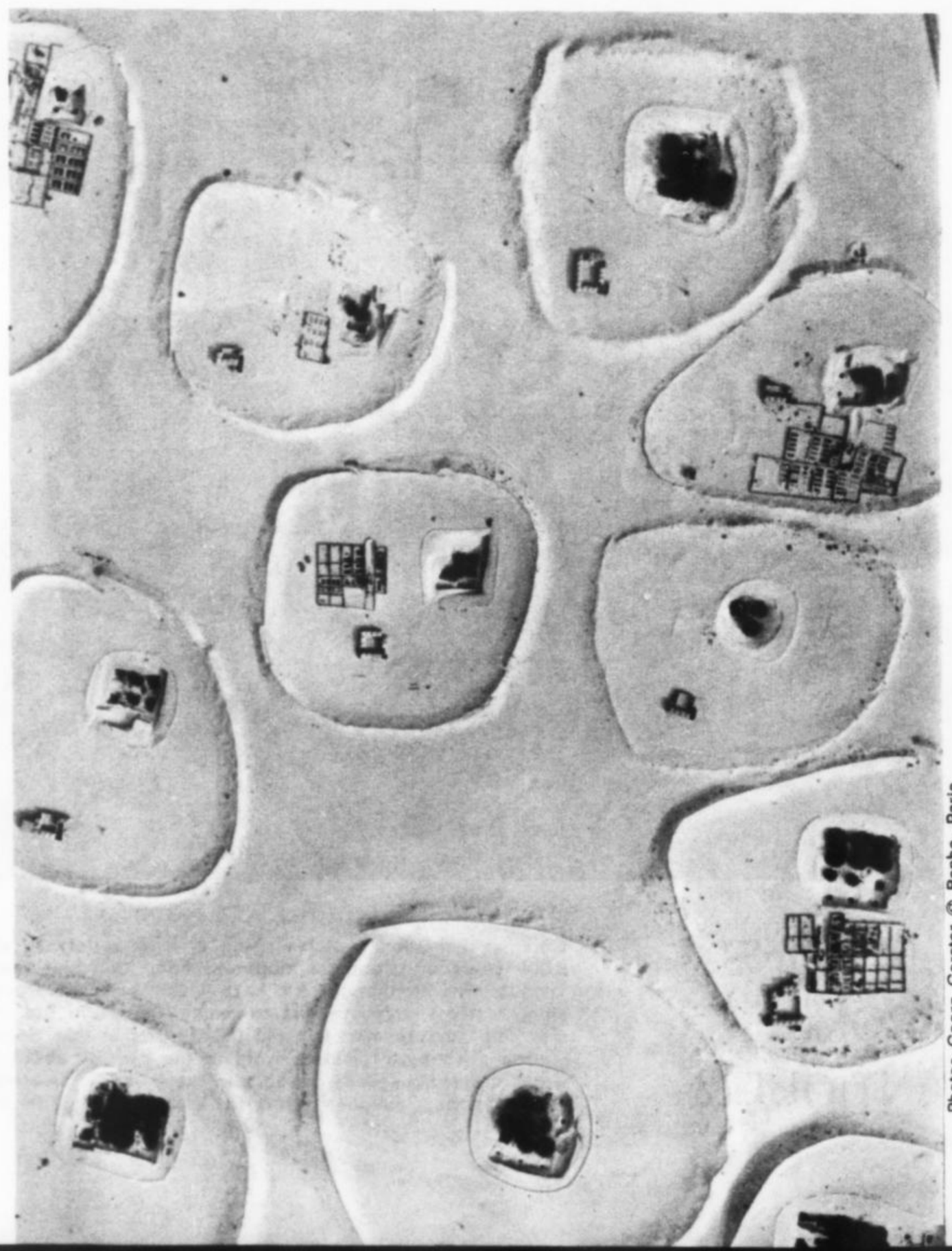
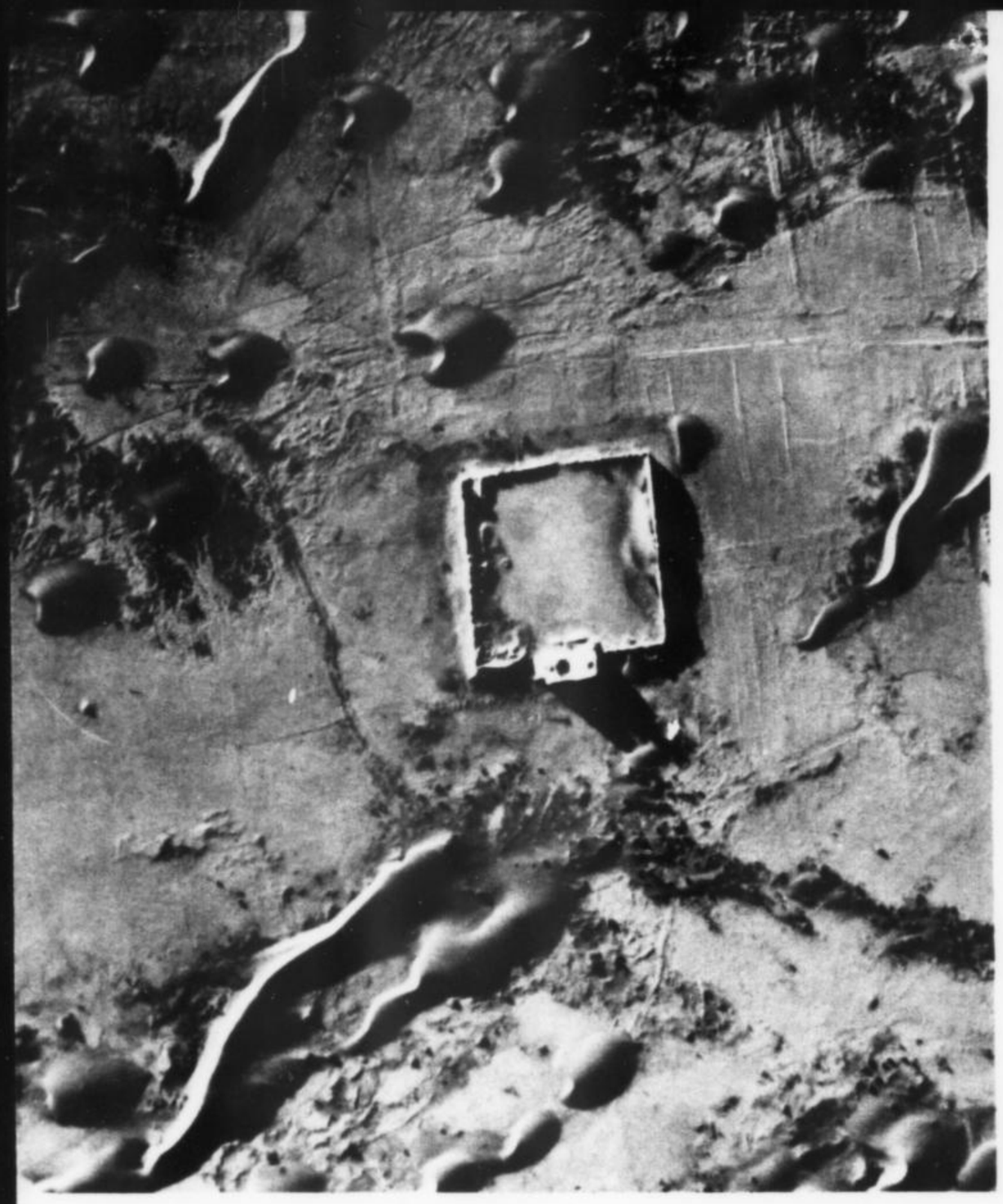
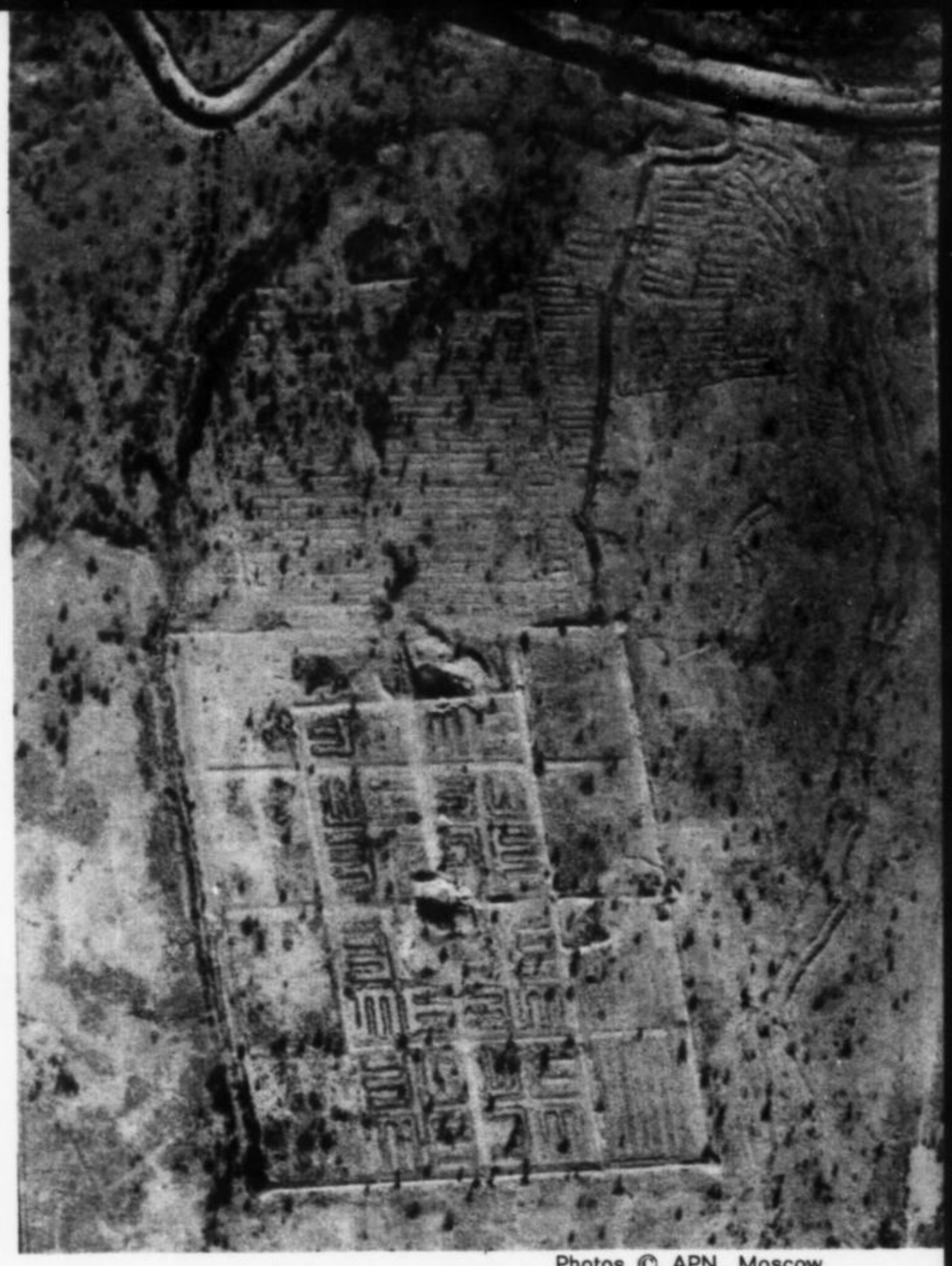




Photos Georg Gerster © Rapho, Paris

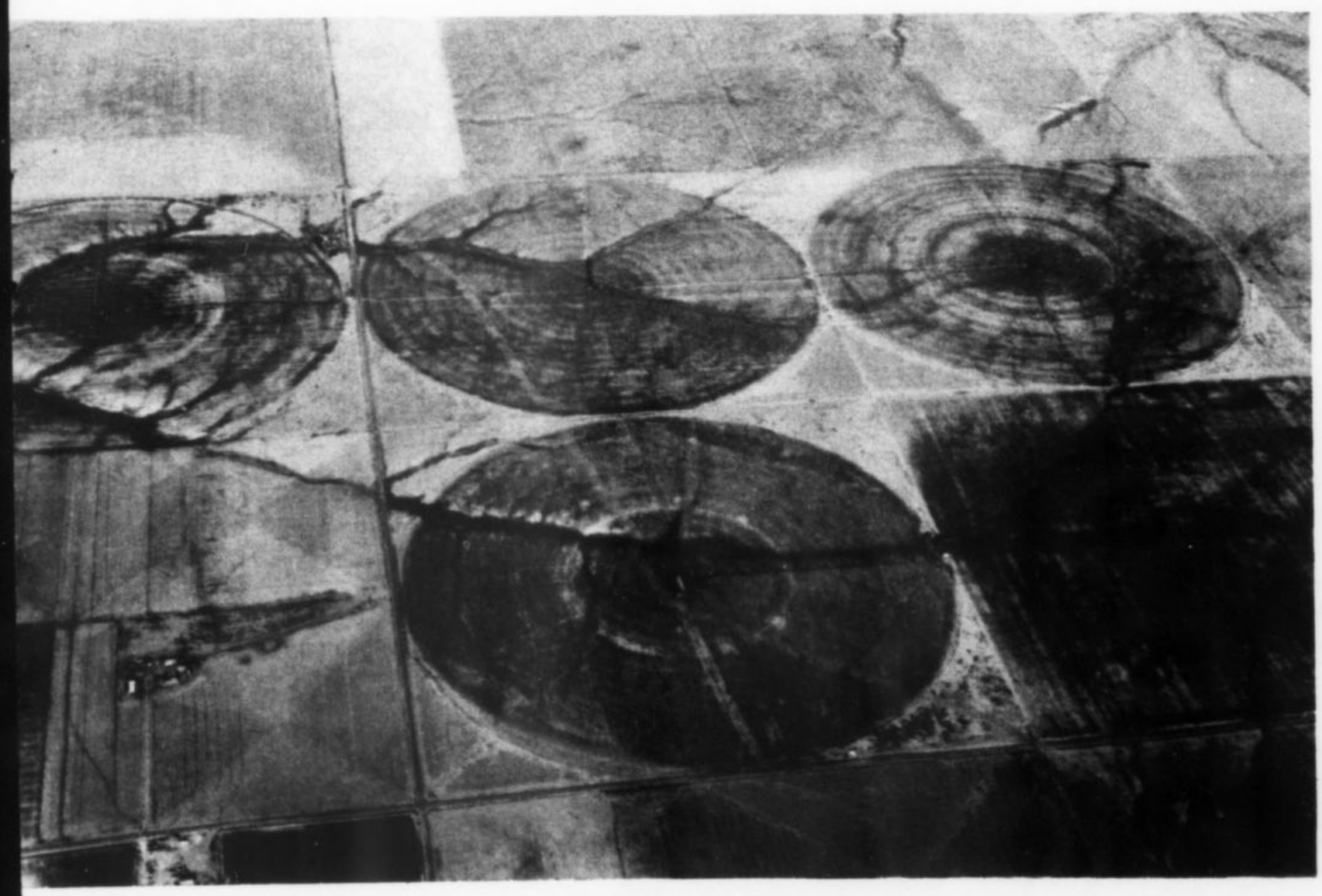




Photos © APN, Moscow

Desert traceries from Central Asia's past

Revealed by the probing eye of an aerial camera, outlines of fields and irrigation canals mark the sites of ancient farming communities in Soviet Central Asia. Soviet archaeologists and historians have located the remains of ancient irrigation systems over an area of 8 to 10 million hectares (20 to 25 million acres). Above left, traces of irrigation canals of antiquity are still visible among the sand dunes close to Zamakhshar, near the mouth of the Amu Darya river. Centre, rectangular pattern of ancient fields stands out near a fortress abandoned in the 8th or 9th century. Right, vines and melons once grew in the fields close to the remains of the Dev Kes-Ken fortified settlement, whose ancient irrigation canal is seen at top of photo.



'Pancakes' from present-day Algeria and the U.S.A.

Opposite page, "Pancake" oases in the Sahara desert, Algeria, where palm trees planted in man-made hollows draw sustenance from underground water. Unesco, in co-operation with Algeria, Tunisia and the U.N. Development Programme, is surveying underground water resources in the northern Sahara. Left, huge circular patterns formed by irrigation sprinklers at Moses Lake, State of Washington, U.S.A.

Exploit of Czechoslovak colour printing for International Book Year

TREASURES OF MEDIEVAL BOHEMIA

ONE of Europe's finest illuminated manuscripts of the Romanesque period, the 11th century Codex of Vysehrad has recently been reproduced in a superb facsimile edition in Czechoslovakia. The facsimile, a masterwork of modern printing technology, was published with the assistance of the Czechoslovak National Commission for Unesco, as a prelude to its programme for International Book Year 1972.

The Codex of Vysehrad, also known as the Coronation Codex, was written and illuminated on the order of Vratislav I, to mark his coronation in 1085 as the first king of Bohemia. Vratislav was the first prince of Bohemia's ruling Premyslide dynasty to assume the title of king, conferred on him by the Emperor Henry IV.

Vratislav's coronation codex, today preserved in the Czechoslovak State Library in Prague, is an illuminated Latin text of readings from the Gospels, consisting of 108 parchment sheets, 41.4 cm. by 34 cm. Twenty-six pages carry pictures of the Evangelists, four others retrace the genealogy of Christ and a further four are inspired by scenes from the old Testament. A Christological cycle recounts the life of Christ in a series of 29 scenes.

The texts of the codex are inscribed in Latin in majuscule (capital letter), writing, and include many highly decorative initial letters. The manuscript is held in a binding of wooden boards covered in leather, and in a fragment of the original remaining linen, overlaid on the back cover by fragments of richly decorated material.

The reproduction of a facsimile edition of the manuscript was a challenging task, involving many technical problems. It was accomplished by Pragopress Publishers, for their "Cimelia Bohemica" series of publications. Before printing began, hundreds of tests and verifications were carried out: six zinc plates, each reproducing a different colour, were needed for every page.

Numerous corrections and modifications were made before a page proof was pulled, and when a perfect colour register had been achieved, each proof was submitted to the publishers' technical committee for final approval.

Equally complicated and painstaking work went into the reproduction of the original binding. Guided by fragments of the original material, a specialist designed a five-colour brocade which was woven on an ancient loom borrowed from a museum.

These combined efforts have enabled the facsimile edition to restitute to the Codex of Vysehrad an appearance whose original splendour had been diminished by the centuries.

The facsimile edition comprises 222 pages, of the same size as the original manuscript, printed in five or six colours on art paper. Bound in brocade with a white leather back, it is presented in a special leather case together with a separate volume giving a brief historical introduction by Frantisek Kavka of Charles University, Prague, and a commentary by Jiri Masin, of the National Gallery, Prague. The introduction and commentary are published in Czech, English, Russian, German and French.

In all, 780 numbered copies of the Codex were published to mark the 50th anniversary of the establishment of the independent State of Czechoslovakia. One copy was presented to Unesco's Director-General, Mr. René Maheu, last year, by Mr. Joseph Grohman, representative of Czechoslovakia on the Unesco Executive Board.

The Codex of Vysehrad takes its name from the church of Vysehrad, the original owner of the manuscript, in whose possession it remained until it was acquired by the library of the Seminary of the Archbishopric of Prague in 1728. Some historians believe that the manuscript was originally prepared for the St Vitus Cathedral in Prague Castle, where the coronation of the Czech kings took place.

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COLOUR PAGES

The Codex of Vysehrad, a masterpiece of medieval art, was inscribed and illuminated for the coronation of the first king of Bohemia in 1085. A superb fascimile edition has recently been produced in Czechoslovakia. On our pages in full colour we present a few of its remarkable illustrations, reproduced by our Paris printers Imprimerie Georges Lang.

OPPOSITE :

In the Codex of Vysehrad, both Christ and God the Father are depicted without beards and are given a youthful appearance. This highly stylized painting of "Christ's Baptism in the Jordan", portrays God looking down from Heaven while the Holy Ghost descends in the form of a dove.

CENTRE PAGES :

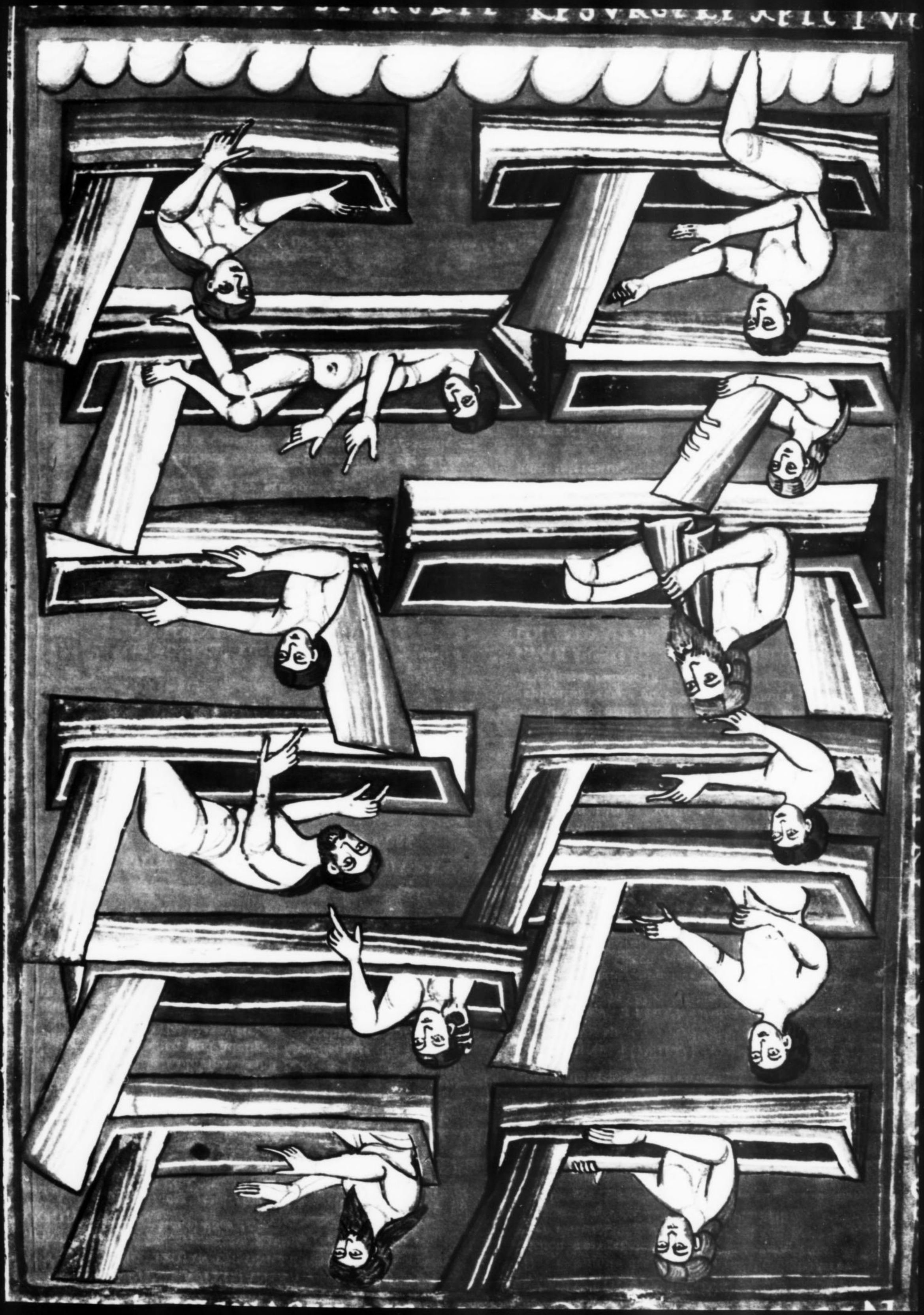
The text of the Codex is richly decorated with numerous ornamental initials interlaced with floral designs and often featuring symbolic figures.

Top left, the letter "O" incorporating a dog and a serpent.

Bottom left, Isaiah making his prophecy concerning the house of Jesse from which Christ descended. The opening words of the prophecy, written on a scroll held by Isaiah, allude to the "rod of Jesse", depicted as a tree with seven branches on which perch seven doves.

Right, "The Adoration of the Magi", portrayed with expressive simplicity. The enthroned Madonna and Child, as represented here, are typical of the art of the Romanesque period, and in particular its sculpture.

Photos Pragopress, Prague



EGREDIETVR VIRGA
DE RADICE IESSE·ET·FLOS·IN·ASCENDET
ET REQVIESCET SP̃S
IN EVM SP̃S DNI

The Codex of Vysehrad is the largest and most magnificent of four existing manuscripts which there is every reason to believe came from the same workshop. Of the three other manuscripts, one is kept in the library of the St Vitus Chapter in Prague castle and the other two are in Poland where they are believed to have been sent as gifts shortly after their completion.

The Czech scholar Jan Kvet has described the decoration of the Codex of Vysehrad and of the other manuscripts in the same group as one of the most important chapters in the history of Bohemian art. Despite its affinities with Bavarian miniatures, he writes, it contains so many special features that one would be justified in referring to it as the first school of Bohemian painting (1).

Palaeographical and liturgical analyses of these manuscripts, writes Jiri Masin in his commentary to the facsimile edition, suggest the wide influence of the Regensburg scriptory. But no analogies so far established can explain the originality of style used by the "Master of the Codex of Vysehrad" and followed by his assistants who illluminated the rest of the manuscripts in the group. There is no doubt that this Master, a gifted and inventive artist, has left a stamp of a crystalline purity on this particular expression of the 11th century art of Romanesque book painting.

The theory that the Codex of Vysehrad was produced in the Brevnov monastery seems justified. This monastery was one of the most active cultural centres in Bohemia and maintained good relations with the reigning Premyslide dynasty. According to Jiri Masin, it is likely that an accomplished, though today unknown, artist—the Master of the Codex of Vysehrad—was invited from abroad to Bohemia to execute there, with the help of his assistants, this princely order. ■

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(1) Paintings from the Codex of Vysherad figure in "Czechoslovakia: Romanesque and Gothic Illuminated Manuscripts", a large-format album of colour reproductions in Unesco's "World Art Series", published by the New York Graphic Society (out of print), and in "Czechoslovakian Miniatures from Romanesque and Gothic Manuscripts", a paperback published in the "Unesco Pocket Art Series" as a "Mentor-Unesco Art Book" by the New American Library, New York, and as a "Fontana Unesco Art Book" by Fontana Books, Collins Publishers, London (out of print). A series of 30 colour transparencies, "Czechoslovakia: Romanesque and Gothic Illuminated Manuscripts" is published in Unesco's world art collection of slides, by Publications Filmées d'Art et d'Histoire, 41, rue du Dragon, Paris-6, with trilingual English-French-Spanish commentaries (price equivalent of about $10 in local currency).

Opposite: "The Resurrection of the Dead", one of the most extraordinary paintings in the Codex of Vysehrad. Framed with inscriptions in hexameters, the six pairs of superimposed tombs seem to float on their golden background like so many boats.

Below, detail from the painting depicting "The End of Judas' Betrayal", in which Judas returns the thirty pieces of silver, near to the tree on which he later hanged himself.

Photos Pragopress, Prague

Iron-Age Man Preserved

THE BOG PEOPLE OF DENMARK

by P.V. Glob

ONE spring morning in 1950, two Danish farmworkers cutting peat at Tollund Fen in central Jutland discovered a body in the peat layer they had just uncovered. Looking down at the well-preserved features, they could only suppose that they had come across the victim of a recent murder.

The police were soon on the scene, and with them they brought representatives of the local museum, since well-preserved remains of Iron Age men were not unknown in the region. I was hastily summoned from Aarhus University and, that same evening, bent over the discovery, I found myself face to face with an Iron Age man who had been deposited in the peat-bog some two thousand years earlier.

The dead man lay on his right side in a natural attitude of sleep. The head was to the west, with the face turned to the south; the legs were to the east. He lay fifty yards out from firm ground and had been covered by eight or nine feet of peat.

On his head he wore a pointed skin cap fastened securely under the chin by a hide thong, and round his waist was a smooth hide belt. Otherwise he was naked. His hair was cropped short and he was clean-shaven, although his chin and upper lip were covered with very short stubble.

Round his neck was a rope made of two leather thongs twisted together and drawn tight into his throat in a noose and then coiled like a snake over his shoulder and down across the back.

The Tollund man's head was remarkably well preserved, the best preserved human head, in fact, to have survived from antiquity in any part of the world. The dead man's lightly-closed eyes and half-closed lips give the face a distinctive expression, calling to mind the words of the world's oldest heroic epic, the *Gilgamesh*, "the dead and the sleeping, how they resemble one another."

A wooden crate was assembled on the site of the discovery so that the Tollund man could be removed to the National Museum in Copenhagen in exactly the position in which he was found.

The doctors and medico-legal experts who examined him in Copenhagen concluded that he had probably been hanged rather than strangled by the rope found round his neck. X-Rays showed that the skull was undamaged and the brain intact but shrunken. The wisdom teeth had developed indicating that the man must have been appreciably over twenty years old at the time of death.

An autopsy showed that the inner organs, such as the heart, lungs, and liver were well preserved as were the stomach and the large and small intestines which contained traces of the dead man's last meal, eaten between 12 and 24 hours before death. Apparently this had consisted of a gruel prepared from barley, linseed, "gold of pleasure" and various other weeds, but there was no trace of any meat or fish.

After these exhaustive examinations, the head underwent conservation treatment, and was sent to the Silkeborg Museum, not far from Tollund, where it can be seen to this day. Dark in hue, the majestic, 2,000 year old head is still full of life; it astonishes the beholder and rivets his attention.

Barely two years after the discovery of the Tollund man, in April 1952, another body was discovered in a Jutland fen. This time it was in the Nebelgard Fen at Grauballe, about eleven miles east of Tollund. When

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PETER V. GLOB *is Director-General of Danish Museums and Antiquities and Director of the Danish National Museum in Copenhagen. An internationally known archaeologist and a leading authority on Danish prehistory, he has directed numerous excavations in Denmark, Greenland and the Persian Gulf. For further reading on the Bog People, see Prof. Glob's "The Bog People: Iron-Age Man Preserved" (Faber and Faber, London, and Cornell University Press, New York, 1969; Paladin, London, 1971). Among Prof. Glob's other books on archaeology are "Ard and the Plough" (1951), "Rock Carvings in Denmark" (1969), and "The Mound People" (1970). His latest book, "Danish Prehistoric Monuments" (Faber and Faber, 1971) is an exceptionally attractive account of the rich heritage of archaeological remains in Denmark, from the Stone Age to the Vikings.*

Photos Lennart Larsen © P.V. Glob. National Museum, Copenhagen

The head shown here is 2,000 years, and the hand 1,500 years old. They belong to two of the many well preserved bodies of men and women discovered in the peat-bogs of Denmark. The age of these two bodies has been confirmed by carbon 14 tests. Tollund Man (left) has the best preserved head of any Iron-Age man yet unearthed from the bogs. The skin patterns on Grauballe Man's hand (right) are so clear that perfect fingerprints—some of the oldest fingerprint patterns in the world—were obtained from them.

GUARDIAN OF THE HARVESTS

Photos © National Museum, Copenhagen

BOG PEOPLE OF DENMARK *(Continued)*

I was called to the scene, the man's head and shoulders were sticking up out of the dark brown peat. I immediately arranged for the body to be transported to the Museum of Prehistory at Aarhus, still in the block of peat in which it lay.

The Grauballe man had been placed in his peat grave completely naked and no objects of any kind were found in the vicinity. Carbon 14 dating of the liver and muscle tissue and dating by pollen analysis placed the date of death between 210 A.D. and 410 A.D.

X-Rays and examination of various bone tissues and the teeth established the Grauballe man's age at around thirty years.

There could be no doubt about the cause of death. A long cut ran round the throat practically from ear to ear, so deep that the gullet was completely severed.

The Grauballe man was perfectly preserved, though somewhat flattened by the over-lying peat. His hair was about six inches in length and short stubble on his chin and upper lip showed that he had been clean-shaven.

Radiography of the head showed that the brain was remarkably well preserved though a little shrunken. The two halves of the brain and its convolutions could be clearly seen in the X-Rays.

His last meal was similar to that of Tollund man consisting of a gruel of grain and seed, but containing no trace of summer or autumn berries or other fruit or greenstuffs. There are thus grounds for thinking that both men met their deaths in winter or early spring, before everything had come into leaf. It may be deduced that they were both sacrificed and placed in the peat-bog as offerings at the mid-winter celebrations or the festivals of spring.

Examination of the beautifully preserved feet and hands revealed such clear line patterns that it was possible to take prints of several of his fingers, the oldest known fingerprints of any human being.

When investigation of the Grauballe man was completed, and before he was given conservation treatment, a plaster cast was made of him lying in exactly the position in which he was found in the peat-bog.

During the 1,500 years he had lain in the peat-bog a tanning process had

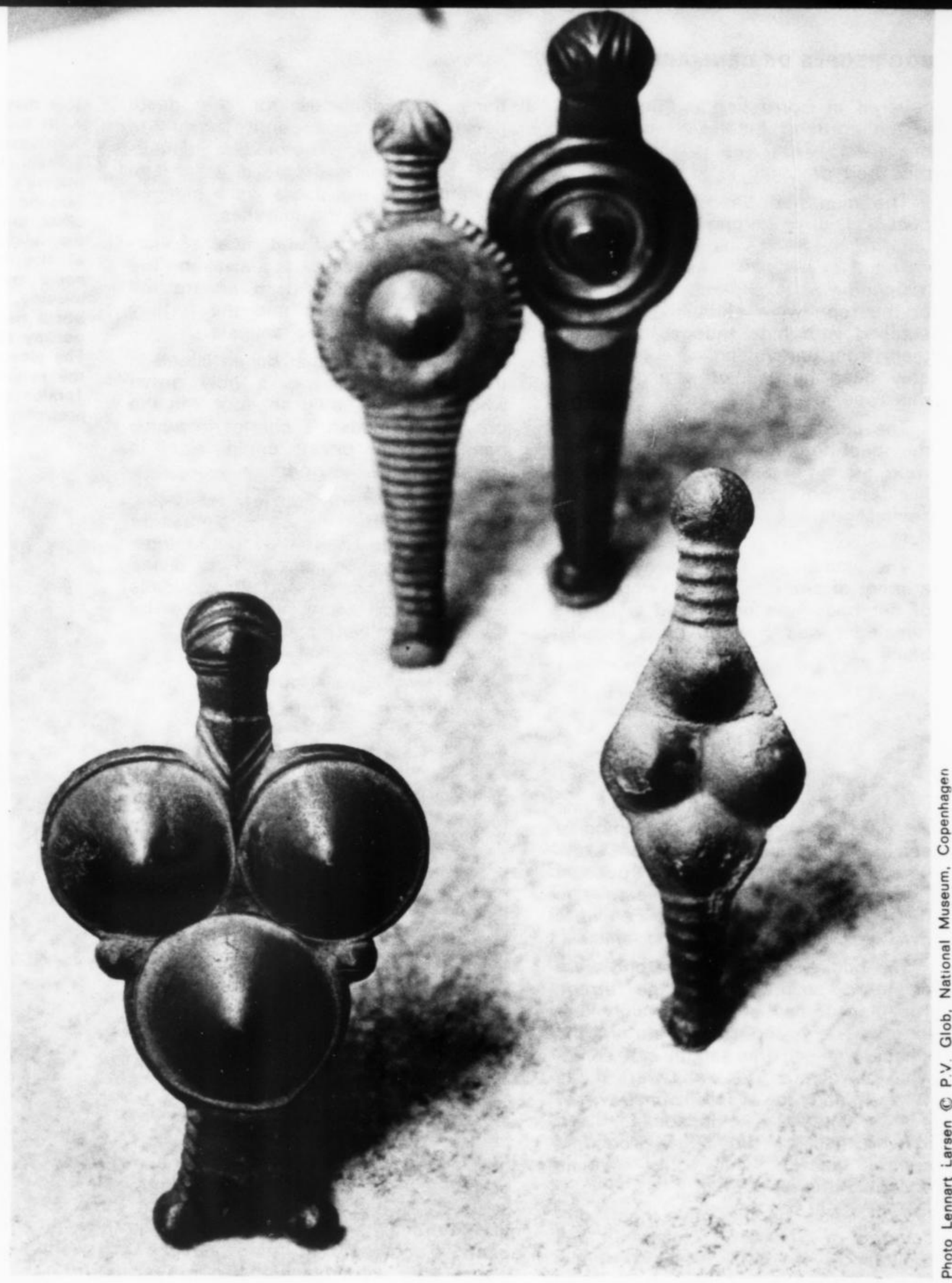

Photo Lennart Larsen © P.V. Glob, National Museum, Copenhagen

Top left, this is the famous silver cauldron recovered in 1891 from a peat-bog at Gundestrup, Denmark. The cauldron had been placed there as a sacrificial offering. It is splendidly decorated inside and out with male and female divinities, religious processions and sacrificial scenes. Where this 2,000-year-old masterpiece of the metalworker's art originated is not known, but it may have come to Scandinavia as booty of war. The "Bog People" of N.W. Europe, as they are now called, worshipped Nerthus, the Earth Mother and goddess of fertility, to whom they prayed for good harvests. Detail from inside the cauldron (left) shows the goddess surrounded by fabulous animals. Right, different stylized versions of the goddess dating from the Iron Age in the forms of amulets and brooches (a remarkable similarity in shape is to be seen in the photographs on pages 28-31).

been taking place which had preserved him up to our day. This process begun by nature was successfully completed in a laboratory by the "pit-tanning" technique, using oak bark, to which the body was subjected for just over a year and a half. Since then the Grauballe man has been exhibited in the Museum of Prehistory at Aarhus, where he lies just as he was found in the peat-bog.

The peat-bogs of north-west Europe have yielded up nearly 700 bodies of men, women and children preserved by nature for twenty centuries. Most of the bodies of these people, who lived during the early centuries of the Christian era, were found in Denmark, and more than half of them in the Jutland peninsula and the adjoining regions of north-west Germany. Other bog people have been found in England, Wales, Scotland and Ireland and, in smaller numbers, in Norway, Sweden and central Europe.

It is the acid in these peat-bogs, as well as the low oxygen content of bog water, which has tanned the skin and hair of the bodies and preserved them as though they had only recently been placed there.

But only very few of these bog people are still in a good state of preservation. Most of the bodies crumbled away as soon as they were exposed to the oxygen in the air, since no one seemed to know how to preserve them. A few have been saved by a careful drying process, in particular the body of a woman found at Haraldskjaer in Denmark, in 1837. The experts of the day thought that this might have been the body of the Norwegian Queen Gunhild who was murdered by being drowned in a peat-bog 900 years earlier.

But the body was later identified as that of an Iron Age woman dating back a further thousand years. Her body is still preserved and lies in the crypt of the church of St. Nicholas at Vejle, in Jutland, in an oak coffin personally presented by King Frederick VI.

Another early discovery, dating back to 1780, is that of a woman of rank unearthed from a peat-bog near Drumkeragh Mountain in Ireland. She was dressed in a finely-woven red and green garment and a stole embroidered with figures, and she lay on three woollen blankets.

Other well-preserved bodies of bog people found in Denmark include those of a man and a woman, un-

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covered in Borre Fen at Himmerland, in the north of Jutland, near the site of an early Iron Age village in which they had probably lived.

The man had been placed in the peat-bog in a sitting position. The back of his head was crushed in and round his neck was a hemp rope fastened with a slip-knot. Both ends of the rope were skilfully bound and stitched with hide thongs to prevent them from unravelling. He had probably been hanged or strangled with this rope.

The dead man had been brought to the peat-bog naked except for the rope around his neck. Rolled up at his feet, however, were two capes, sewn together from pieces of light and dark sheepskin.

The woman lay face downwards on a sheet of birch bark. The upper part of her body was uncovered while the remainder was covered by a woollen blanket.

ON an island in the same Fen, an iron Age village consisting of some twenty houses has been excavated. Like most Jutland peasant houses of two thousand years ago those of the village of Borre Fen were dwellings for both men and animals.

The houses varied in size and were clustered round the village street. The biggest house is eighty-eight feet long by twenty-three feet wide and the smallest is half this length and somewhat narrower. The walls were made of turf and the roofs of straw or heather thatch. The inhabitants lived in one half of the house round a central hearth while the animals occupied the other half.

Other bog people have been discovered in Schleswig Holstein close to Jutland's southern border; they are now exhibited in the local museum of Gottorp castle in Schleswig. Among them are an elderly man and a young girl found in a peat-bog at Windeby farm in 1952.

Also to be seen at Gottorp castle is the head of a man wearing a curious hair style, described by the Roman historian Tacitus in his treatise on the German tribes, written at the time of the bog people, in the first century A.D. The reddish hair, originally blond, was eleven inches long. It was gathered at the right side into a skilfully contrived knot which, Tacitus tells us, was a style typical of the Swabian tribe. Similar knots are to be seen in Roman sculptures depicting the Germanic tribes.

Writing on human sacrifice among the Germani, Tacitus states that this was connected both with the punishment of crime and the ritual of spring worship of the gods. Concerning Germanic law, he writes that accusations and demands for the death penalty could be brought before the tribal assembly. Traitors and deserters were hung from a tree and cowards and evil-doers were plunged into the mud of the marshes.

Each year a dramatic ritual of worship was enacted to awaken the forces of nature and to ensure the germination of corn and the fertility of man and domestic animals.

Tacitus tells us that on an island in the ocean there was a holy grove where no man could set foot. In the grove was hidden a chariot in which none but a priest could ride in company with the goddess.

In this chariot, drawn by oxen, they drove through the countryside awakening life and fertility in all things. The goddess then retired to her divine abode. The chariot and the goddess were washed in a secret lake by slaves and ministrants who were then drowned in the lake.

The many people found in the peat-bogs may, therefore, have been placed there as punishment for crime or as sacrifices to the great goddess, whom Tacitus calls Nerthus, or Mother Earth.

During the centuries preceding and following the birth of Christ, such a goddess was worshipped in northern lands. She is depicted in several small bronzes wearing only two rings around her neck and sometimes in her ears and with her hands under her life-giving breasts.

The Mother goddess had already been worshipped in neolithic times. Her eyes look out at us from the clay pots of this period and her symbol is to be seen on slate pendants worn as amulets.

During the period of the bog people, in the late iron age, this goddess reigned supreme over all other gods and she is represented in highly stylized form on bronze jewel-pins. Many bracelets and necklaces have been discovered in the peat-bogs where they were placed as offerings.

A magnificent silver cauldron was found in a peat-bog near Gundestrup in Jutland. It is decorated with embossed figures representing, on the outside, gods and goddesses with their attendants and, on the inside, scenes showing the goddess surrounded by legendary beasts and human sacrifices.

The Gundestrup cauldron was made in south-east Europe where it was captured as war booty, brought back to Denmark and placed as an offering in a peat-bog near Borre Fen. But several of the deities worshipped by the bog people of Denmark are represented on the cauldron.

The Tollund man and many of the other bog men, after their brief time as the companion and lover of the goddess, may have been sacrificed and placed in the peat-bogs in which they have been so remarkably preserved. ■

This massive statue —the "fat woman", as it has become known—was discovered in the central temple at Tarxien, Malta. It dates from Maltas's neolithic period (around 1600 B.C.). As with many other ancient sculptures unearthed on the island, the head and upper part of the body, perhaps fashioned from some material other than stone, are missing. When intact, the statue was about two metres high and is thought to portray the Mother Goddess seated. The pleated skirt is a feature that reflects the refinement in art that marked the Tarxien period, zenith of Malta's prehistoric civilization.

Photo © Paul Almasy, Paris

Headless 'Venus figures' of Stone-Age Malta

Text and photos by Paul Almasy

THE Maltese archipelago, consisting of the islands of Malta (the largest island of the group), Gozo, Comino, Cominotto and Filfola, lies 60 miles off the southern tip of Sicily in the central Mediterranean.

Strategically placed between Europe and Africa, Malta has a long history. In ancient times the archipelago was occupied successively by the Phoenicians, the Greeks, the Carthaginians and the Romans. But Malta's megalithic monuments, not isolated as elsewhere in Europe, but grouped together, bear witness to a flourishing Maltese civilization in prehistoric times preceding, according to some archaeologists, the Aegean, Cretan and Mycenaean civilizations.

One thing is certain, the men who built the great megalithic temples with enormous blocks of stone must have used well advanced techniques for lifting and transporting slabs that weighed many tons.

Where did the earliest people of Malta come from? To which ethnic group did they belong? When did they first tread the soil of Malta? These are questions which to this day remain unanswered, although it is thought that the first peoples must have settled in the island some 6,000 years ago.

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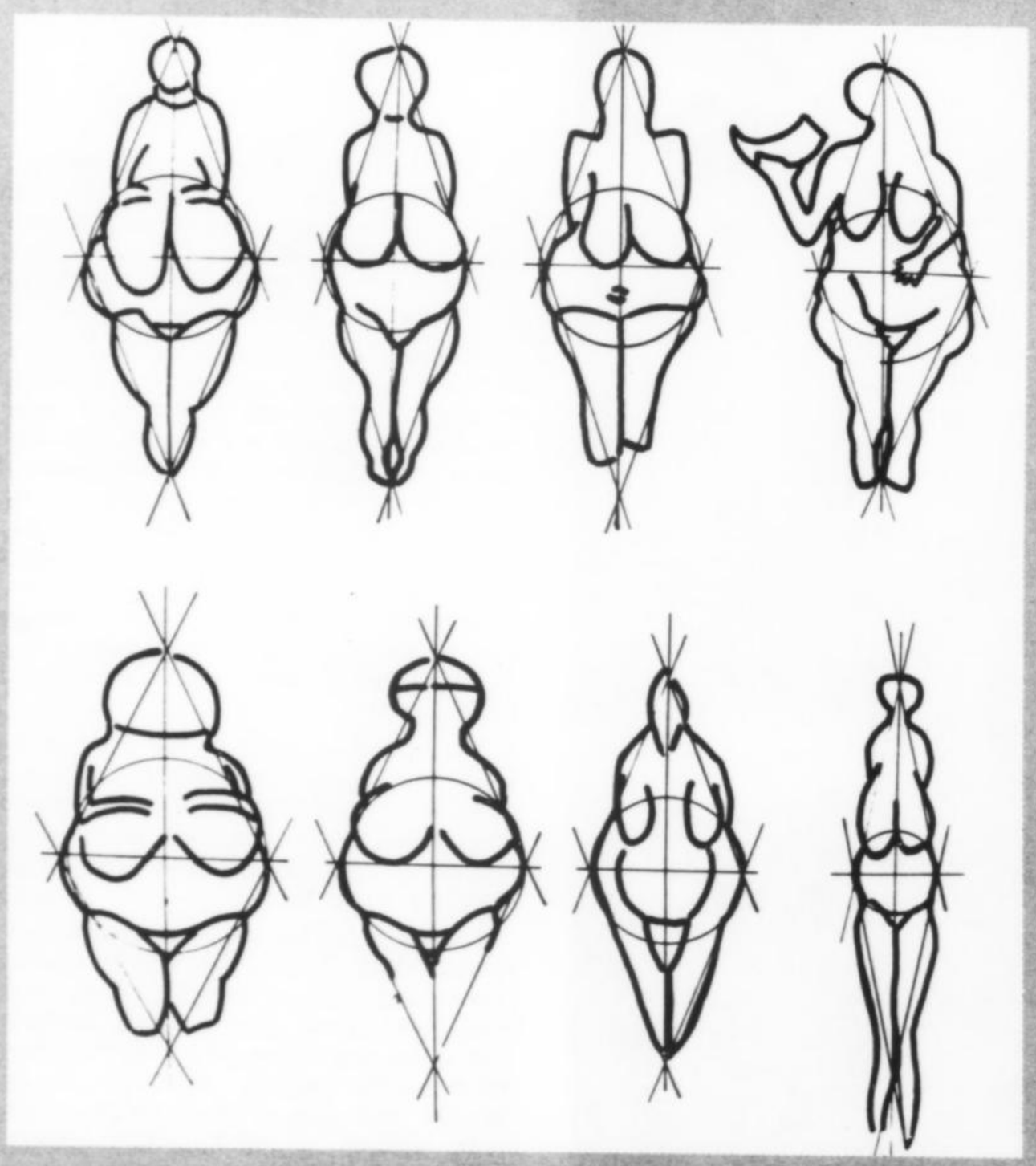
PAUL ALMASY, *of France, has gained an international reputation as a photographer-reporter of unusual artistry and vision. His work is well known to readers of the "Unesco Courier" from the many photographic assignments he has carried out for the magazine during the past 20 years. Exhibitions of Mr. Almasy's work have been held in many countries. Mr. Almasy produced the above reportage on special assignment for the "Unesco Courier".*

The legend of the Tower of the Giants

The pottery objects found at Ghar Dalam (or Dalam cave), long thought to be the most ancient in Malta, are very similar to those of the same period discovered at Stentinello, near Syracuse, which suggests that the first inhabitants of Malta came from Sicily, the largest of the neighbouring islands. But the decorative motifs of the Ghar Dalam pottery are also found on pottery from further east, in Dalmatia, in Cilicia and other countries bordering on the eastern coast of the Mediterranean.

Some historians believe that the Maltese of the neolithic era came from Libya. The bay in which the Dalam cave lies, known as Marsaxlokk, is situated in the south-eastern part of the island. Marsaxlokk and Valetta, which is situated on the north coast, are the island's best natural ports, and if it is accepted that the first men to come to Malta landed in the bay of Marsaxlokk, then it seems more likely that they crossed the sea from Libya and not from Sicily.

The Ghar Dalam period, placed by archaeologists between 2500 and 2100 B.C., was followed by the Mgarr period, which takes its name from a small site in the north-west of the island where the ruins of a temple, known as the Ta'Hagrat temple, were discovered.



Drawings © from "Préhistoire de l'Art Occidental" by André Leroi-Gourhan, Editions Mazenod, Paris, 1965

FEMININE BEAUTY 20,000 YEARS AGO. — Numerous statuettes of corpulent women have been found at Palaeolithic sites in Europe, in places as far apart as western France and the Don Valley in the U.S.S.R. These "Venus figurines", as they are known, were made about 18,000 B.C. Drawings above show eight of the Palaeolithic Venus figurines, modelled according to a common pattern. The bulk of the trunk—breasts, belly and pelvis—fits within the circumference of a circle and the sharply tapered legs and narrow shoulders lie close to the limits of isosceles triangles. Drawn in outline by the French prehistorian André Leroi-Gourhan, the figurines (left to right and top to bottom) are from: Lespugue (France); Kostenki (U.S.S.R.); Dolni-Vestonice (Czechoslovakia); Laussel (France); Willendorf (Austria); two centre figures, Gagarino (U.S.S.R.) and Balzi Rossi (Italy). Stone-Age sculptors in Malta, 16,000 years later, gave the same ample forms to their statues of women, as did the artists of the Iron Age, two thousand years ago, to amulets representing the fertility goddess, discovered in Danish peat-bogs (see page 27).

Small in size, this temple was both a shrine and a burial place. The dry stone-building technique appears to be already fairly advanced, but the construction of the roof must have posed considerable problems. It is thought that this was also constructed of carved stone, in large thin slabs, but it is not known how these were assembled.

Zebbug, another site in the western part of the island, has given its name to the next period. In 1947, archaeologists discovered several tombs and a considerable quantity of pottery there. Among the decorative motifs were representations of a small human head.

The various artefacts found in the temples and tombs of the Mgarr and Zebbug periods provide valuable evidence of the evolution of ways and customs over the centuries that separate these two periods. In addition to pottery, the principal finds at Ghar Dalam and Mgarr were tools fashioned from bone and flint. The tombs at Zebbug, however, contained ornaments, the most numerous of all being necklaces made from shells. However, the chronological order of the Mgarr and Zebbug periods has not been definitely established, and some experts place Zebbug before Mgarr on the basis of carbon 14 dating.

From Zebbug, one crosses the narrows separating Malta from the island of Gozo to reach Xaghra and the Ggantija temples (the "Tower of the Giants" as they have come to be known) which have given their name to the next period.

Situated on a hillside with a panoramic view stretching out to the northern coast of the tiny island, the remarkable temples of Ggantija rightly deserve their fame. The southern temple, the largest of the two temple buildings, was built to a plan which bears certain resemblances to those of churches of the Christian era.

On each side of the 108ft long central corridor, which might be described as the "nave", are two small rooms. At the end of the central corridor is the apse which is marked off by a low partition wall about two feet in height. Part of the left hand side of the central corridor was probably used as a sacrificial altar.

The Phoenician inscriptions found here give no indication as to when these bold sailors from Asia Minor came to the island of Gozo. It is thought that they used Malta and Gozo as staging ports and worshipped in the temples.

The northern temple is in the form

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Photo © Paul Almasy, Paris

This headless limestone statue, 48 cm. high, was discovered in the ruins of Hagar Qim, a temple complex first excavated in 1839, in the south-west of Malta. The holes at the top are sockets where the head was fitted. Though no sexual characteristics are indicated, the shape of the body, recalling those of Palaeolithic Venus figurines (see opposite page) suggests a female divinity.

of a square with sides measuring 82 feet. The rooms into which it is divided feature several niches which are differently placed from those of the southern temple. Careful examination of the interior walls suggests that they were covered with bright red paint. In view of the size of these rooms, it is unlikely that they had stone roofs and the builders probably made them of wood, though the possibility that they were left without roofs cannot be entirely ruled out.

It is surprising that the Ggantija temples, gigantic for their time, were built on this particular site. In this part of the island there is no trace of the limestone rock of which they are built. It must have been brought from Ta'Cenc, on the south coast of the island some considerable distance from Xaghra.

Transporting this material from Ta'Cenc to Xaghra represented a remarkable feat at that time. It must certainly have made an impression on popular imagination since a legend relates that a giantess carried the stones on her head, at the same time holding a baby in her arms and feeding it along the way.

Tarxien, on the island of Malta, is the most famous archaeological site in the archipelago. It was during the Tarxien prehistoric period that the ancient Maltese civilization reached its apogee. To their technical mastery the builders added artistic taste and feeling. Not only were the stone blocks carefully hewn and dressed; they were also decorated with designs in relief. Most of these decorations are carved in spiral patterns and other geometrical figures, though some motifs represent animals.

The Tarxien group consists of three interlinked temples. Their existence was unknown to archaeologists until 1915 and they were eventually discovered by accident. The fact that they remained buried for centuries explains their perfect state of preservation.

One discovery that immediately attracts attention is the statue of an enormously fat woman placed in the middle of the central temple. The statue is impressive, even though the upper part of the body is missing, and is probably a colossal representation of the goddess of fertility.

The majority of the stones of the Tarxien temples are blackened with smoke, which suggests that the Bronze Age inhabitants of the island cremated their dead there. The ashes of innumerable funeral pyres erected in the temples throughout the Bronze Age and the broken remains of burnt urns recovered there, have been submitted to scientific, carbon 14 testing. The results of these tests have enabled a precise chronological table of the various stages of this period in the prehistory of Malta to be established.

The Hal Saflieni Hypogeum (or Paw-la Hypogeum), an ancient catacomb discovered not far from the Tarxien temples, also ranks among the most important archaeological remains of Malta. Like the Tarxien temples, the catacomb was discovered by chance during the construction of two blocks of houses in 1902. Entirely carved from the rock, which here forms a limestone plateau, the Hypogeum is several centuries older than the Tarxien temples.

The Hypogeum is an architectural complex of halls, passages, chambers, stairways and high-walled galleries, into which are carved niches of varying shapes and sizes, spread out on three levels.

The largest and most carefully constructed room, the inner sanctum or "Holy of Holies," is situated in the upper part of the catacombs, and it is here, in all probability, that animal sacrifices were made. Access to the third storey is difficult and the stairway leading to it ends with an impassable step some six feet high.

The purpose of the room below this stairway is still a matter of conjecture. Some specialists believe that it was a treasury and that it was to protect its contents from robbers that access was made so difficult. Others maintain that it was merely a water tank.

During the Bronze Age the period of invasions began and Maltese civilization gradually lost its originality. The isolation that Malta, as an island, had experienced up to the Stone Age was disturbed by the arrival of sailors from the eastern Mediterranean, from Greece, from neighbouring islands such as Sicily and Lipari, and even from the Gulf of Lions. Improvement in boat-building techniques and in navigation brought Malta within reach of the bold seafarers who had set out to seek their fortunes in distant lands.

The newcomers brought with them new customs and beliefs which they imposed upon the peoples of the islands who, small in number, were unable to defend themselves. The objects discovered in the tombs of succeeding periods are so different that they cannot be explained in terms of the evolution in customs of a single people. Such radical transformations can be due solely to the cultural contributions of invading peoples.

No doubt this tiny country with such a turbulent history conceals beneath its soil other precious traces of the past. ■

Photos © Paul Almasy, Paris

Temple complexes discovered in Malta, and in particular that of Tarxien, show that a well-established religion existed in the Island 3,500 years ago. Excavations at Tarxien between 1915 and 1919, laid bare major structures raised by neolithic builders. Photo right, of part of the Middle temple at Tarxien, shows the passage leading to the inner rooms. Access, however, is blocked by a small slab gracefully carved with two spirals, a decorative motif also found on ancient monuments in Crete. Many stones in the Tarxien temples are blackened with smoke suggesting that the dead were cremated there in ancient times. The huge stone slabs used to build these and other Maltese temples have inspired a legend that a giantess transported the stones on her head, while feeding the baby she carried in her arms.

Six hundred million new literates in twenty years

A crucial point has been reached in the massive world effort to wipe out illiteracy, according to the latest information received by Unesco.

Some of the updated statistics covering the last two decades look like light at the end of the tunnel. They show that:

■ round the world, the number of people who can read and write has risen by 600 million since 1950, the rate of increase keeping ahead of the rate of population growth;

■ in the regions with the greatest illiteracy—Africa and the Arab States, Asia and Latin America—illiteracy rates have dropped over the past ten years;

■ the tide is turning in Latin America, where the percentage of illiterates has been cut by more than a quarter to 23.6 per cent and where, for the first time and against the world trend, the absolute number of illiterates has been reduced;

■ despite the rise in population, the number of illiterates rose marginally less than had been predicted.

But world figures, also serve several warnings. The estimates reveal:

■ a staggering total number of illiterates in the world—even counting the reduction on the predicted rise: 783 million instead of 810 million;

■ in Africa and the Arab States the drop in illiteracy rates still leaves 73.7 per cent of the adult population unable to read and write;

■ even on the most optimistic projections, the number of illiterates in 30 years is not likely to be less than 650 million or about 15 per cent, so the problem of illiteracy may not be solved this century.

Replies to a questionnaire sent to Unesco Member States make the perspective clearer and tend to confirm hopes that at last the right approach to the problem has been taken on a world scale. According to the Unesco statistics, the proportion of illiterates in the world—not far short of 50 per cent in 1950 and still 40 per cent in 1960—is now down to 34.3 per cent.

The 73.7 per cent illiteracy rate in Africa and the Arab States and the 46.8 per cent rate in Asia still represent a gigantic task, but in ten years Latin America has cut its rate from 32.5 per cent to 23.6 per cent, demonstrating what can happen when the two-pronged attack through primary education and adult literacy instruction begins to break through.

For in 1957, Latin American countries launched a continental "major project" to extend primary education and, in ten years, increased enrolments by 35 million children. Adult literacy programmes on the continent, such as Colombia's famous "Radio Schools of Sutatenza" have also been in operation for some years and are gaining impetus.

In Asia and Africa, however, relatively newly independent countries have only begun to tackle the problem of providing primary education, let alone adult literacy teaching.

Replies to Unesco's questionnaire show that literacy and adult education are now widely regarded as integral parts of social and economic development. Roughly half the countries with a literacy problem take this view, and have included literacy in their national development plans. Allied to this is an increasing acceptance of the "functional literacy" approach promoted by Unesco: literacy teaching that gears reading, writing and arithmetic to daily life and work, with literacy and job training combined as part of industrial and agricultural development projects.

After a long count-down, Unesco-assisted projects under the Experimental World Literacy Programme are just beginning to have a measurable effect, the most advanced projects now having reached the expansion stage: in India, 64,800 adults are being taught, in Iran, 55,000; in Mali, 40,000; in Tanzania, 20,000.

Enrolment in these 13 projects has risen from 25,000 in September 1969, when the first became operational, to more than 235,000 today. The rate of increase in enrolments will speed up this year and if countries decide to create future programmes they will have a solid base of literate workers to build on.

The "if" is a big one. Future action to combat illiteracy will depend on the priority given and the funds available: in neither case is present evidence cause for optimism. For example, returns from 44 countries giving figures which are internationally comparable reveal only four (only one a developing country) spending more than three per cent of their education budget on adult education, including literacy. Three-quarters of the countries were allocating less than one per cent to adult education and since literacy forms only part of this, the priority—or lack of it—is clear.

In fact, developing countries have rapidly increased their total spending on education in the past decade. But though the percentage of the total education budget of developing countries nearly equals that being spent by industrialized lands (in Africa, the 1965 average of 16.4 per cent is even higher), the absolute amount is incomparably less for populations which are frequently incomparably greater.

While their Gross National Product only inches forward, there is small prospect of much more money being found by the developing countries themselves. Dr. V.K.R.V. Rao, when he was India's Education Minister, advocated a national emergency programme to reduce the 150 million illiterates in the 15-25 age group to 50 million by 1981. Even at a cost of only $4 a head, this would require $400 million. India's Fourth Plan, however, provided for only $1.3 million.

The dilemma is whether resources should be concentrated on providing primary education or whether the problem should be tackled through adult literacy instruction. Belief is growing that the best solution is an attack on both fronts; reports of drop-out rates (as high as 81 per cent in Africa) indicate that merely providing schooling is not the whole answer. Until the problem of resources is solved at an international level, however, part solutions are likely to set the pace for progress. ■

ANCIENT IRRIGATION AND MODERN SCIENCE

(Continued from page 16)

work of this expedition, making it possible to link scientific studies, particularly cartography, with the tasks of modern economic development. Excavations of the ancient farming villages and the towns of Khorezm, systematic exploration of the whole area and the use of detailed maps drawn up from aerial photographs, have produced an overall picture of the agricultural history of the oasis at the lower reaches of the Amu Darya.

A legend relates that in ancient times the Amu Darya did not flow into the Aral Sea, but into the Caspian. According to the legend, the king of Khorezm won from the king of the "East" the right to divert the river towards Khorezm only "for one day and one night". However, the disobedient river, once turned, continued to flow towards Khorezm. The people there "ran canals from it and built towns along its banks". Archaeologists have now determined how and when agriculture actually began in Khorezm.

AGRICULTURE and canal building in the lower reaches of the Amu Darya began in the middle of the 2nd millenium B.C. In ancient times, the Amu Darya had a huge triple delta, consisting of hundreds of channels. Natural silt deposits gradually filled the upper channels and they ultimately disappeared.

The ancient irrigator, who learned his methods from nature, observed this process and made use of it. The hydrographic changes he saw taking place gave him the idea of controlling small natural river channels and using them, with the help of ditches, to provide a more or less regular water supply for his fields.

At first, agriculture depended solely on natural flood irrigation; later it made use of the gradually disappearing delta channels, which were adapted for irrigation by means of short aryks, or irrigation ditches, leading from them.

According to the American archaeologist, Robert McCormick Adams, irrigation in ancient Mesopotamia, where natural conditions were similar to those of the Khorezm oasis, evolved in the same way.

Nature herself pointed the way to technological progress for the ancient irrigation engineers. As early as the Bronze Age, men discovered the principle of gravity flow and built head structures far upstream of the delta channels to ensure a steady flow of water to their fields. Yet irrigation in this early epoch still depended solely on the whims of the river.

In the 6th-5th centuries B.C., during the Persian Achaemenid dynasty when Khorezm became a large slave-owning state, irrigation engineering underwent a sharp change. The huge irrigation systems of this period in no way resembled the small river beds adapted for irrigation in the primitive epoch.

The building of such irrigation systems required vast manpower resources as well as strict state organization and control. The process was accompanied by radical changes in the structure of society, the formation of classes and the consolidation of state power.

Numerous fortified settlements were established in the oasis, and the area under irrigation was increased many times over. Here grain crops—barley, wheat and millet—and cotton were raised. Viticulture, horticulture and melon cultivation were developed. Local growers became skilled in selection methods and raised the best melons in the world and special varieties of grapes. Remarkably enough, in the lower reaches of the Amu Darya the ancient traditional dimensions of the vineyards (width of beds, 3.2 to 3.6 metres) and the melon fields (up to 2.2. metres) have been preserved to this day.

The growth of irrigation farming in the ancient Khorezm oasis was interrupted in the middle of the Ist millennium, a time of widespread social upheaval and a decline in agriculture. But the ancient lands with irrigation systems were developed once again in the 7th-8th centuries during the so-called Afrigidian period. The huge 90 kilometre-long Kyrk-Kyz canal on the right bank of the Amu Darya was put into operation, and numerous fortifications sprang up along its length.

In the year 712, however, the oasis was invaded by an army led by Kuteiba, who ordered all the ancient Zoroastrian books burned and the magi—the custodians of knowledge about irrigation—put to death. Afterwards, in the words of al-Biruni, the 11th century Khorezm scholar and scientist, "the people of Khorezm remained illiterate and depended on memory for what they needed."

The 11th to the early 13th centuries saw a new upsurge of life in the oasis. Khorezm was transformed from a poor northern principality into the centre of a great Eastern empire. The domain of the Khorezm shahs extended from the Aral Sea to the Indus River, from Iraq to Ferghana.

The huge expanse of abandoned land was again developed, and on the left bank of the Amu Darya even advanced for dozens of kilometres into the heart of the desert. This area, studied by an expedition working along the Chermen-Yab canal, has retained all the engineering features of medieval irrigation. This differed from the ancient systems in its more economical use of the land within the basin, larger side branches, and the introduction of complex branch layouts and water-hoisting wheels. All this was connected with the efforts of farmers to reduce silting up in the canals, and thus lessen the work of cleaning them.

While the overall territory occupied by irrigation installations was reduced, the area irrigated actually grew, since new lands were irrigated within the existing basins.

Basically, this phenomenon, seemingly paradoxical at first glance, reflects the general trend of progress in irrigation that can be traced from ancient times right up to our day. The coefficient of land use has grown from 5-10 per cent in ancient times, to 30-40 per cent in the Middle Ages, and to 50-70 per cent in modern irrigation engineering systems.

THE flowering of the Khorezm oasis was cut short in 1220 by the Mongolian invasion. Genghis Khan's advance detachments appeared at a time when the rulers of Khorezm were still at the zenith of their glory.

The Mongolian invasion was disastrous for the farming oases of Central Asia. At the lower reaches of the Amu Darya not only was right-bank Khorezm depopulated, but so were the vast lands on the left bank, where the once densely populated oasis (30,000 inhabitants) along the Chermen-Yab canal was turned forever into desert.

The dam at Urgench was destroyed and the dykes fell into disrepair. The river waters, whose level was higher than that of the oasis land, destroyed the dykes and flooded the fields and villages for a time.

In the 13th and 14th centuries, a

Photo © Tue Pham - Fiap, Bucharest, Romania

Malayan farmers carry shrubs that will be planted to stabilize and check the spread of coastal sand dunes.

large part of Khorezm was incorporated into the Golden Horde. During this period, cities and villages were revived and the area of land under irrigation grew.

But the destruction that accompanied Timur's invasion in 1379 caused the waters of the Amu Darya to break through to the west again, through the Daryalyk river bed to the Sarykamish depression, filling it to a level that allowed it to drain along the dry Uzboi river bed into the Caspian. Urgench perished and, as archaeological findings have shown, only one area of habitation survived, in difficult conditions, up to the 17th century.

Stormy political events, strife and wars between feudal lords, and population migrations all militated against settled irrigation farming. The outskirts of the oasis, where there was a frequent population turnover, suffered the most.

Such scant but revealing facts from the history of irrigation in the lower Amu Darya region illustrate the close connexion between political and social events and the fate, for better or worse, of the irrigated lands.

Today, the traces of ancient irrigation that stand as memorials to the labour of many generations of farmers are helping the peoples of Central Asia to tame the desert. In the Kara-Kalpak Autonomous Soviet Socialist Republic, for instance, water flows once again in the newly reconstructed Afrigidian Kyrk-Kyz canal, which had been abandoned back in the 8th century.

IN 1952 the Khorezm expedition began to systematically map the ancient irrigation systems. The maps have since been profitably used in planning the contours of new irrigation tracts on the left bank of the Amu Darya.

As long ago as 1962, it was proposed to revive the vast formerly irrigated lands at the lower reaches of the Syr Darya and Amu Darya, by creating a huge rice-growing region covering up to two million hectares to the east of the Aral Sea. It is now planned to divert the waters of Siberian rivers towards Central Asia. Here again, archaeologists have begun to draw up maps of the ancient irrigation areas.

Irrigation specialists and archaeologists of the Uzbek SSR are doing similar work in Bukhara where the second section of the Amu-Bukhara canal is under construction. Over 50,000 hectares of land will be developed for cotton growing here in the near future.

Knowledge of the history of the irrigated lands and in particular detailed drawings of the ancient water supply systems, based on aerial photographs, will be dependable guides for this development project.

Thus, the experience of bygone peoples is being put at the service of modern economic development. And, as never before, science is co-ordinating the search for solutions to complex theoretical problems with the urgent tasks of economic progress. The study of farming methods used by those who lived in lands where irrigation was used is a concrete example of this co-ordination.

Ten years from now, the traveller to these lands will be greeted by verdant gardens and orchards, hillsides white with cotton and new villages spread out over what was only recently a wasteland. ■

Boris V. Andrianov

UNESCO NEWSROOM

PICASSO PAINTING ON U.N. STAMP

This U.N. stamp, issued recently to commemorate the United Nations School in New York and Geneva, reproduces a painting done in 1938 by Pablo Picasso of his daughter Maia, then a child. It is the second Picasso work ever to be printed on a stamp (the first was his famous work "Guernica", painted in 1937). The stamp commemorating the U.N. school has appeared in three denominations: 8 and 21 cents and Sw. Fr 1.10. As agent in France of the U.N. Postal Administration, Unesco's Philatelic Service (place de Fontenoy, Paris-7e) stocks all U.N. stamps and first day covers currently on sale.

Iran's ethnological museum

Iran has set up its first ethnological museum, designed to show the diversity of Iranian ethnic groups and traditions, in the Gulestan Palace, in Teheran. A Unesco specialist, Mrs Teresa Battesti, helped to collect, organize and catalogue its exhibits.

Man and the Biosphere

A new Unesco programme is to mobilize international scientific co-operation to find out exactly what we are doing to nature and what nature is doing to us. The International Co-ordinating Council of this "Man and the Biosphere" programme recently defined its general objectives: to develop a basis within the natural and social sciences for the rational use and conservation of the resources of the biosphere and for the improvement of man's relationship with the environment; to predict the consequences of today's actions on tomorrow's world, so that man can use his global resources more efficiently. The research involved will range from Arctic tundra to tropical forests. Thirty-six national "Man and the Biosphere" committees have been asked to prepare programmes of environmental education and training.

Vacation Study Abroad

Unesco has just published the 20th edition of "Vacation Study Abroad" (55p, $1.50), an indispensable guide to opportunities for study and travel abroad. The present edition gives full facts on short courses, seminars, summer schools, scholarships and travel grants in 60 countries, available to students, teachers and others planning to study or train abroad during their vacation.

More aid needed for Palestine refugee schools

An urgent plea for further international aid to finance education for Palestine refugees was made at the United Nations recently by Mr. Alfonso de Silva, Director of Unesco's Office for Liaison with the U.N., in New York. Costs of the programme had risen because of the growth of the school-age refugee population. Despite international aid totalling $1 million in cash and $700,000 in kind, following an appeal in 1971, cuts in the refugee education might become inevitable if new resources were not soon made available.

New strategies for education

The International Commission for the Development of Education, set up by Unesco last year, plans to send fact-finding missions to the People's Republic of China and the German Democratic Republic. Members of the Commission have already visited 18 countries to assess national experiences in educational development. The Commission will present its findings and its recommendations for new strategies for the expansion and improvement of education around the world to Unesco's Director-General later this year.

Astuter computer

By the turn of this century there is an even chance that computers will be the intellectual equals of the average citizen, predicts the computer specialist, Dr. Irving John Good, in the latest issue of Unesco's quarterly, "Impact of Science and Society" (Vol. XXI, No 4. Price, $1.24, 40p). Current computers, says Dr. Good, are logical machines but not thinking machines. New computer technology and new methods of writing programmes will enable us to make computers "creative", capable of "learning" and much more capable of simulating human mental processes.

Flashes...

■ *FAO reports that world agricultural output increased two per cent in 1970. Food production in the Far East rose by five per cent overall and by one to two per cent per head of the population.*

■ *Sweden and the International Development Association are to grant India $10 million for the construction of cereal storehouses.*

■ *The world's motor-car population increased threefold, from 73 million in 1960 to 226 million in 1970, reports the World Road Federation.*

■ *Tokyo is the most populous city in the world with 9,005,000 inhabitants in 1969, according to the latest issue of the United Nations Demographic Yearbook. New York has the second largest population with 7,798,757 inhabitants in 1970.*

BOOKSHELF

■ **Population, Resources, Environment; Issues in Human Ecology** by Paul R. Ehrlich and Anne H., Ehrlich. W.H. Freeman and Co., Reading, U.K., 1970 (£4.20)

■ **The Problem of Chemical and Biological Warfare.**
Vol I, **The Rise of CB Weapons** (£7.50, $16.50).
Vol IV, **C.B. Disarmament Negotiations 1920-1970** (£7.50, $16.50)
Vol V, **The Prevention of CBW** (£4, $9) Stockholm. International Peace Research Institute
Publishers: Almqvist and Wiksell, Stockholm ; Humanities Press Inc., N.Y.; Paul Elek Ltd., London, 1971

■ **The Arms Trade with the Third World**
Stockholm International Peace Research Institute. Almqvist and Wiksell, Stockholm; Humanities Press, New York; Paul Elek Ltd, London, 1971, 910 pp ($15, £6, Sw. Fr. 60)

■ **No Man is Alien: Essays on the Unity of Mankind,** edited by J. Robert Nelson. E.J. Brill, Leiden, Netherlands, 1971 (48 guilders)

■ **History for a United World,** by E.J. Dance. Harrap, London, Toronto, Wellington, Sydney, 1971 (£2.24 hardback; £1.60 paperback)

■ **Mary Wollstonecraft: Her Life and Times,** by Edna Nixon. J.M. Dent and Sons, London, 1971 (£3.50)

■ **An Original Theory of the Universe,** by Thomas Wright. Introduction by Michael A. Hoskin. Elsevier, Amsterdam, 1971 (Dfl 110)

■ **Hoofed Mammals of the World** Pictures by Ugo Mochi, text by T. Donald Carter. Charles Scribner's Sons, N.Y., 1971 ($9.95)

■ **The Life of Sharks,** by Paul Budker. Weidenfeld and Nicholson, London, 1971 (£4); Columbia Univ. Press, N.Y. ($12.50)

■ **Madly Singing in the Mountains An Appreciation and Anthology of Arthur Waley,** edited by Ivan Morris. Walker and Co., N.Y., 1970 ($12.50)

■ **Indian Folk Arts and Crafts,** by Jasleen Dhamija. National Book Trust, India, New Delhi, 1970 (Rs. 10.25)

■ **Common Indian Birds: a Picture Album,** by Salim Ali and Laeeq Futehally. National Book Trust, India (Rs. 15)

■ **Journal of Arabic Literature.** Vol I-1970 (Gld. 28); Vol. II-1971 (Gld 36). E.J. Brill, Leiden.

■ **Archaeology under Water,** by George F. Bass. Pelican paperback, Penguin Books, London, 1971 (40p)

■ **Tyre through the Ages,** by Nina Jidejian. Foreword by Emir Maurice Chébab. Dar El-Mashreq Publishers, Beirut, 1969

■ **Studies in Ancient Technology,** by R.J. Forbes. Vol VIII, on metallurgy in antiquity. E.J. Brill, Leiden, 1971

■ **Sources Archéologiques de la Civilisation Européenne.** Studies and

discussions from an international meeting at Mamaïa, Rumania, organized by the Association Internationale d'Etudes du Sud-Est Européen, Bucharest, 1970

■ **The Great Experiment Science and Technology in the 2nd United Nations Development Decade** by Robin Clarke. United Nations, New York, 1971, 54 pp ($1)

■ **Matching Employment Opportunities and Expectations: A Programme of Action for Ceylon.** Report (£1.60, $4); Technical Papers (£1.80, $4.50) International Labour Office, Geneva, 1971

■ **A History of the Theories of Rain,** by W.E. Knowles Middleton. Elsevier, Amsterdam (£2.25)

UNESCO'S TRANSLATION SERIES

CHINA

■ **Cold Mountain**
100 poems by the T'ang poet Han-Shan, translated by Burton Watson. Jonathan Cape, London, 1970, 76 pp (Hardback £1.05, paperback 40p)

DENMARK

■ **The Devil's Instrument and Other Danish Stories,** edited by Sven . Holm. Translated by Paula Hostrup-Jessen. Peter Owen, London, 1971, 266 pp (£2.50); Dufour, Chester Springs, Penn., U.S.A. ($10)

INDIA

■ **Phantasies of a Love Thief: The Caurapancasika.** Attributed to Bilhana. Translated by Barbara Stoler Miller. Columbia University Press, New York and London, 1971, 233 pp ($11)

HUNGARY

■ **Please Sir,** by Frigyes Karinthy. Translated by Istvan Farkas. Corvina Press, Budapest, 1968, 80 pp

JAPAN

■ **Japanese Folk-Plays. The Ink-smeared Lady and other Kyogen,** translated by Shio Sakanishi. Charles E. Tuttle Company, Rutland, Vermont and Tokyo, 1960, 150 pp ($2.50)

■ **A Collection of Tales from Uji,** translated by D.E. Mills. Cambridge University Press, 1970, 459 pp (£3.50)

PAKISTAN

■ **The Shore and the Wave,** by Aziz Ahmad. Translated by Ralph Russell. George Allen and Unwin, London, 1971, 167 pp (£2.60)

■ **Poems by Faiz,** translated by Victor Kiernan. George Allen and Unwin, London, 1971, 288 pp (£3.75)

SWITZERLAND

■ **The Curly-Horned Cow**
An anthology of Swiss-Romansh poems and stories, edited by Reto R. Bezzola. Translated by Elizabeth Miller and W.W. Kibler. Peter Owen, London, 1971, 215 pp (£3.25)

TURKEY

■ **Leyla and Mejnun,** by Fuzuli. Translated by Sofi Huri. Introduction by Alessio Bombaci. George Allen and Unwin, London, 1970, 350 pp (£4)

Unesco's latest Statistical Yearbook

WORLD PROFILE IN FIGURES

Swedes are the world's most avid newspaper readers (more than one copy for every two persons). The U.S.A. has more TV sets than any other country (81 million). The proportion of women enrolled in higher education, where they have long been outnumbered, is rising rapidly (38 per cent today). World book production was 74 per cent greater in 1969 than in 1955.

These figures come from the latest edition of Unesco's Statistical Yearbook, an annual summary of significant facts and figures in education, science, culture and communication (1). The present edition covers over 200 countries and territories. Below, we present a few facets from this statistical portrait of the world we live in.

EDUCATION

Enrolments in primary, secondary and higher education rose from about 325 million in 1960 to about 460 million in 1968. On top of this total came nearly 40 million children enrolled in rapidly expanding pre-primary education.

While the largest part of the increase is still at primary level (about 80 million more since 1960), the greatest proportionate increases are at the higher levels: secondary enrolment rose significantly more than primary enrolment everywhere except in Asia. Enrolments in higher education show a remarkable rise throughout the world, with ten out of every hundred in the 20-24 age-group studying in 1968, compared with only six in 1960. The European figures doubled to more than 16 per cent by 1968, and figures for North America show that nearly half the total age group was receiving higher education in that year.

BOOKS

World book production rose to a record 496,000 titles in 1969. Of this, European production accounted for 225,000 titles, North America produced 71,000, South America 12,000 and Oceania 5,000. Asian production was steady at 100,000 titles, and so was Africa's but at only 8,000. The U.S.S.R., which has published around 76,000 since 1960, produced 1,000 fewer titles in 1969.

Distributed among the estimated world population of 3,552 million, this production means that the 13 per cent who live in Europe get more than 45 per cent of the books, but the 56 per cent who live in Asia get only around 20 per cent. North Americans, who represent less than 9 per cent of the world's population get more than 14 per cent of the books; Africans, who make up nearly 10 per cent, get less than 2 per cent. South America produces less than 3 per cent of the world's books for more than 5 per cent of the population and the U.S.S.R. more than 15 per cent for less than 7 per cent.

TELEVISION

In ten years, the number of television sets in the world tripled to about 251 million by 1969. After the United States, with 81 million sets, came the U.S.S.R. with nearly 31 million, the United Kingdom and the Federal Republic of Germany, both nudging 16 million sets, and France with more than 10 million. But the number rose into the millions in several countries. From 650,000 in 1960, Mexico increased its receivers to 2,553,000 in 1969, Argentina reached 3,100,000, while Brazil increased its receivers more than five times to 6,500,000. The whole of Africa still had only around a million receivers in 1969, but in that year Algeria had 100,000, Morocco 145,000 and Egypt 550,000. With nearly 22 million sets, Japan was well ahead of the field in Asia; other countries where the number considerably increased were the Republic of Korea with 246,000 and Thailand with 241,000. The Republic of Viet-Nam had 373,000.

CINEMA

Among the 47 countries covered by statistics on film production, India shows a regular increase (from 324 films in 1960 to 367 in 1969), and Japan a slight decrease (from 549 to 494) as does France (from 158 to 154). Most films made in co-production came from Italy, 104 out of a world total of 253.

RADIO

In ten years the number of radio sets in the world has increased 82 per cent: 653 million in 1969 as compared with 358 million in 1959. The number of radio receivers per 1,000 inhabitants is a follows: North America, 1,339; U.S.S.R., 375; Europe, 280; East Asia (excluding the People's Republic of China) 192; Oceania, 190; Latin America, 167; Africa, 45; South Asia, 33. The world had 19,110 radio transmitters in 1969.

NEWSPAPERS

World figures show that about 300 more dailies were published in 1969 than ten years earlier. The distribution per thousand of the population shows some changes in the pattern, with fewer in North America, traditionally a top-of-the-table area.

The U.S.S.R. has nearly doubled circulations to some 320 copies per thousand in 1969; the Federal Republic of Germany is ahead of this with 331, but U.S. circulations went down to 305 copies per thousand.

In general, the encouraging increases are in the developing world. In Asia, for instance, while Japan has a clear lead with 503 copies per thousand, only 25 behind Sweden, and Hong Kong has 485, Ceylon has a large proportionate increase from 36 to 58 per thousand. Malaysia, with 74, is on the upgrade. In South America, Bolivia shows an increase from 27 per thousand in 1960 to 34 in 1969. Distribution remains sparse in Africa, with Mauritius still heading the table at 78 despite a falling tendency, and Ghana, with 34, leads distribution rates on the African continent. Four African countries still have less than one copy for every thousand people.

(1) Unesco Statistical Yearbook, 1970, 786 pages. Bilingual:English-French. Paper: £8.70, $29, 116 F. Cloth:£10.50, $35, 140 F.

Letters to the Editor

UNESCO'S 25 YEARS

Sir,

I have just finished reading every word of the August-September "Unesco Courier" on Unesco's 25 years. It is the most remarkable, exciting informative publication I've seen. As an American, I wish a copy could go to every school district in the United States.

May I extend my commendation and appreciation to you and all your staff for this excellent presentation of Unesco.

M. Irwin
Teheran, Iran

INTERNATIONAL UNIVERSITY

Sir,

The idea launched by the Secretary-General of the United Nations for the establishment of an international university (see "Unesco Newsroom", May 1971) opens up new prospects of peace and progress for mankind. Such a United Nations University could be the best means of overcoming the sad realities of the present day in which opportunity of access to higher education is often denied to people with the necessary intellectual ability, on grounds of race, religious beliefs or politicial opinion. For these reasons I feel that men of good will throughout the entire world should give this project their moral and material support to ensure that it becomes a living reality.

Albert de los Toyos
Havana, Cuba

IRELAND

Sir,

The November 1971, issue of the "Unesco Courier" contained an item on the recent Unesco poster competition and I was glad to note among the illustrations a reproduction of the poster for which my young fellow-countryman, Roland Mahon, was awarded a second prize. I was, however, surprised to find an error of nomenclature in the caption. As you will be aware, and as the official Titles of Member States and Associate Members of Unesco makes clear, the name of our country, in English, is Ireland.

I trust you will not mind my bringing this lapse to your attention and that you will believe me when I say how highly I regard the Courier's well-deserved reputation for accuracy and precision.

Eamonn L. Kennedy
Permanent Delegate of Ireland
to Unesco, Paris

STILL LOOKING AHEAD

Sir,

At my advanced age, I was doubtful last year about taking out a two-year subscription to the "Unesco Courier", but this year I shall not hesitate. In fact, the "Courier" gives me more and more the desire and the will to say "No" to the passage of time. The idea of a better future and a happy and united mankind is exalting and this is the future that I see coming alive in your magazine. Having lectured and written a great deal on the subject of "A Council of World Conscience", I find in your pages the echo and the mirror of the highest aspirations of my life.

Raoul Villedieu
Montpellier, France

FIFTY YEARS FROM NOW

Sir,

I imagine that you receive many letters of praise for the "Unesco Courier", but I would like to add my personal congratulations. I am fourteen years old and for a long time I have been very interested and, at times, troubled by the various questions raised in your magazine.

Carthage, Iran, Futurology, reports on the progress of the modern world are all fascinating subjects which concern everyone. I would also like to see, if possible, in a future issue of the "Unesco Courier" an article on the various theories about the possibility of any form of life existing on other planets.

I take this opportunity to wish the "Unesco Courier" a happy 25th birthday, and I hope that when I am an old retired grandfather I shall still be able to look through this "Window Open on the World".

Daniel Piperno
Valence, France

MUSEUM OF THE WORLD

Sir,

At the headquarters of our Office of Educational Studies we have organized a museum in which we assemble and preserve objects from all parts of the world typical of local craftsmanship, specimens of local flora and fauna, archaeological and mineralogical specimens, etc. Our main purpose is to stimulate in our 1,400 pupils an interest in distant countries.

An appeal for objects of this type has been published in a number of Italian magazines and we have already received several interesting objects from various countries. I should be most grateful if, through the different language editions of the "Unesco Courier", you would tell your readers what we are doing and invite them to help us to enrich our "museum".

Vitale Incalcaterra
Direttore Didattico
96 026 Mazara del Vallo, Italy

MAN AND NATURE IN EQUILIBRIUM

Sir,

I have just finished going through two 1971 issues of the "Unesco Courier": "S.O.S. Environment (July)" and "25 Years of Unesco Viewed by a Student of 25" (August-September). I find them exceptionally useful in improving my perspective regarding my country's logical role in the world task of reaching some balance or equilibrium between the resources essential to life, all life, and man.

Man, by his essential craft, ambition and competition, becomes wilfully destructive. I am asking myself to what lengths he would have gone these past 25 years except for the leavening influences of the United Nations, and particularly Unesco?

We are great at sharing lamentations; we are born critics as is every other creature. But young Wayne McEwing, in the August-September issue, does stimulate hope. He is a fact-finder now, an auditor. I hope that one day he will find himself a poet, because he has the universal mind that art requires.

G.L. Collins
Arctic International
Wildlife Range Society
Vancouver, Canada

S.O.S. ENVIRONMENT

Sir,

Your issue of July 1971, "S.O.S. Environment", was of special interest to me. I was made particularly aware of this question by the 2nd World Food Congress held at The Hague in 1970. Previously I had only vague notions about this problem of such importance for the future of mankind. I now fully appreciate why France and other countries have found it necessary to appoint Ministers for the Environment. Unfortunately, in the developing countries the full extent of the problem does not yet appear to have been recognized.

I feel that lessons on the environment and pollution should not only be included in school syllabuses, but should be compulsory.

Father Fernand Parrel
Saigon, Vietnam

'CULTURAL' AWARENESS

Sir,

I am head of a social education department in an English secondary school which caters mostly for "immigrant" pupils—about 50 per cent West Indian and 20 per cent Indian. For the last two years we have been trying to develop a programme which reinforces our pupils' various "cultural" or group awareness backgrounds and yet introduces them to realistic career goals in an English society.

I found your issue on "Answers to Racism" (November 1971) helpful in preparing lessons for the first of our objectives. The main purpose in developing this material was to bring together African, West Indian, Indian and English (European) historical and cultural traditions by using visual, literary and cultural hero material. The article on Miklukho-Maklai in your November issue emphasized his achievement and not that of the Papuans, but since we are presently doing work on people from faraway places, I felt I could use the material on Papua to go along with some "same" and "difference" discussions we had in class. Because I have prepared lessons for third year pupils and shown them to a number of people, a network of teachers interested in doing similar work is being built. I am interested in using material from such publications as the "Unesco Courier".

Robert C. Bennett
The William Murdoch School
Handsworth, Birmingham,
England

Imp. GEORGES LANG, PARIS. IMPRIMÉ EN FRANCE. — Dépôt légal. 1° trimestre 1972 - C 1

A new collection of Unesco records
MUSICAL SOURCES

33 rpm - 30 cm

The first eight records in a new "Unesco Series" of 40 recordings of world music have just been issued under the Philips label.

- **Tibetan Ritual Music (6586 007)**
- **Royal Music of Cambodia (6586 002)**
- **Java—Historic Gamelans (6586 004)**
- **Arab Music (6586 006)**
- **North Indian Vocal Music (6586 003)**
- **Court Music and Banjar Music from Bali (6586 008)**
- **Jewish Music (6586 001)**
- **Iranian Dastgah (6586 005)**

A "musical education on records", the series was produced for the International Music Council, under the general editorship of Alain Danielou, of the International Institute of Comparative Studies, in Berlin, and is sponsored by Unesco.

Where to renew your subscription
and order other Unesco publications

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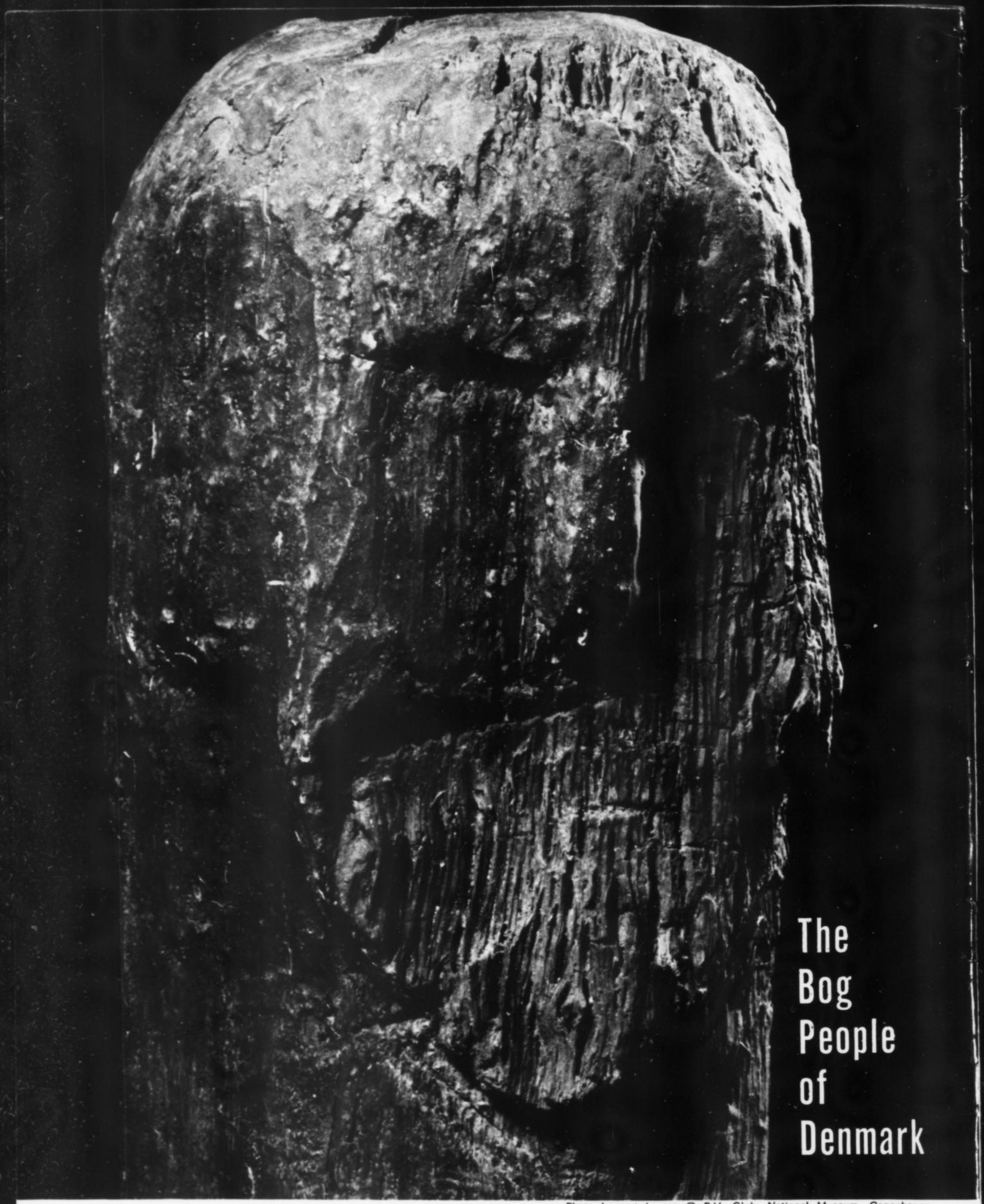

The Bog People of Denmark

Photo Lennart Larsen © P.V. Glob, National Museum, Copenhagen

The peat-bogs of north-western Europe have yielded up hundreds of bodies, preserved for as long as 2,000 years by the acid water. Thousands of objects such as clothing, jewellery, ornaments and other artefacts have also been recovered and have thrown new light on a civilization that flourished in Scandinavia from the 4th century B.C. to the 4th century A.D. This head, carved at the end of an oak branch whose natural shape resembles a human body, is that of a male partner of the goddess of fertility who reigned over the pantheon of gods worshipped by the Iron Age peoples of Scandinavia. It was unearthed in 1880 from a peat-bog near Viborg, in Denmark (see article page 24).